

Post Disaster Redevelopment Plan Volume 1

2012-2013 Edition



Influenced by the near miss of a Category 5 storm (Hurricane Floyd) in 1999, direct impacts from three Category 2 hurricanes in a two year span (2004 and 2005), and lingering memories of the total transformational devastation caused by Hurricane Andrew in Homestead, Florida in 1992, Palm Beach County's Division of Emergency Management concluded that a much more comprehensive actionable guidance document was needed, geared to catastrophic disaster events.



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Quick Reference Guide to PDRP

Volume 1 *PDRP Activation & Implementation*

- What is the Post Disaster Redevelopment Plan
- Where the PDRP Fits in Disaster Recovery
- Goals for Long Term Recovery
- PDRP Activation
 - Decision Triggers
 - Authority
 - Activation Process
 - Types & Levels of Disasters
 - Key Issue Areas
- PDRP Implementation
 - Organizational Concept & Members
 - Implementation through Working Groups
 - Roles & Responsibilities
 - Linkages with State and Federal Agencies
 - Overview National Disaster Recovery Framework Guidance
- Action Matrices (Pre and Post Disaster)

Volume 2 *Technical / Decision Support Information*

- The Hazard Environment (Natural, Social, Built, Economic, Environmental)
- Hazard Analyses/ Risk Assessments
- Special Section: “Sea Level Rise” Vulnerability Analysis & Adaptation Strategies
 - Model
- Detailed Guidance on Key Recovery Issues
 - Governance Challenges during Long-Term Recovery
 - Sustaining Essential Governmental Services in Face of Economic Crisis
 - Infrastructure/Public Facilities Restoration
 - Land Use
 - Housing
 - Economic Redevelopment
 - Health & Social Services
 - Environmental Preservation/Restoration
 - Public Outreach
- Funding & Assistance Sources/Strategies
- Detailed National Disaster Recovery Framework Guidance
- Glossary of Referenced Terms
- Acronyms
- Maps

Volume 3 *Administrative Support Information*

- Plan Development
- Integration with Other Community Plans
- “Sea Level Rise” Plan Integration Model
- PDRP Feedback, Reviews and Critiques
- Plan Maintenance/Updating
- PDRP Rosters/Resources/Contacts
- Appendices

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Promulgation Statement

This Post Disaster Redevelopment Plan (PDRP) is intended to serve as a single source, countywide document to promote, assist and facilitate post and pre-disaster decisions and actions relating to long-term community recovery, reconstruction and economic redevelopment following major or catastrophic disasters. The 2012-2013 editions are an update of the plan adopted by the Board of County Commissioners in 2006 and supersede all previous plans promulgated for this purpose.

This PDRP has been developed to complement, support and expand the guidance offered by Palm Beach County's Comprehensive Plan, Comprehensive Emergency Management Plan, Recovery Plan and other official county and municipal policy and operational documents addressing topics and issues relevant to long-term community recovery and redevelopment.

The content and format of this PDRP were developed to meet or exceed the guidance offered by relevant state statutes, *Post-Disaster Redevelopment Planning: A Guide for Florida Communities*, published jointly in 2010 by the Florida Department of Community Affairs and the Florida Division of Emergency Management, the National Response Framework, and the provisions outlined in the draft National Disaster Recovery Framework.

Oversight of the development, maintenance, enhancement and administration of this PDRP is the responsibility of the PDRP Executive Committee. Implementation of the plan rests primarily with the Working Groups identified herein. The Division of Emergency Management, under the direction of the PDRP Executive Committee, is charged with administering and coordinating PDRP program activities in accordance with local, state and federal guidance, including the periodic review and updating of the plan's content in accordance with best professional and planning standards and practices.

This plan is hereby promulgated as of the sign date below.

Bill

Johnson RN

Digitally signed by Bill
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Bill Johnson, RN, Director
Division of Emergency Management

February 8, 2013

Date

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TABLE OF CONTENTS

INTRODUCTION	8
Origin of Post Disaster Redeveloping Planning in Palm Beach County	8
Post Disaster Redevelopment Plan	9
Description	9
Purpose	9
Guiding Principles.....	9
Goals and Objectives	10
Benefits	11
Using This Plan	11
Statutory Guidance	12
Types and Levels of Disasters	12
DISASTER MANAGEMENT PROCESS	13
Relationship of the PDRP with Other Local Plans	13
Short Term Recovery Phase.....	14
Long-Term Recovery.....	15
Key Goals of Long-Term Community Recovery	15
Successful Community Recovery	16
PDRP Planning Process	16
PDRP ACTIVATION	17
Triggers/Considerations.....	17
PDRP Activation Decision Authority	18
PDRP Activation Process	18
Types and Levels of Disasters.....	19
PRIMARY HAZARD VULNERABILITY ASSESSMENTS AT A GLANCE	23
Hurricanes	23
Inland Flooding.....	24
Dike Failure	25
Sea Level Rise	26
Key Post Disaster Subject (Issue) Areas	27
PDRP Deactivation.....	28
PDRP IMPLEMENTATION THROUGH WORKING GROUPS	28
PDRP Executive Committee	29
Working Groups.....	29
Redevelopment Task Force	30
OVERVIEW OF PRIMARY AREAS OF FOCUS AND MEMBERSHIP	31
Executive Committee Responsibilities & Membership	31

The Redevelopment Task Force Responsibilities and Composition.....	33
Economic Redevelopment Working Group	34
Infrastructure & Public Facilities Restoration Working Group	36
Land Use Working Group	37
Environmental Restoration Working Group	38
Health and Social Services Working Group	39
Housing Recovery Working Group	40
Governance and Financial Administration Working Group	41
Public Outreach Working Group	42
Stakeholder Organization and Participation	43
PDRP Support Staff	43
PDRP	44
Guidance Offered by the National Disaster Recovery Framework (NDRF)	44
Role of the Recovery Operations Center (ROC)	48
Pre Disaster PDRP Implementation	49
ACTION PLAN.....	49
Short-term Recovery Actions	50
Pre Disaster Short-Term Actions	51
Pre Disaster Long-Term Actions	66
Post Disaster Long-Term Recovery Actions	71
RECORD OF REVISIONS	76

INTRODUCTION

Palm Beach County's geographic location, coastal beauty, exotic environmental resources and appealing tropical climate have greatly influenced its explosive growth and prominence as a great place to live, work and visit. However, these same natural characteristics also contribute to its vulnerability to a full range of natural and man-caused hazards. The County has a storied history of disaster events, including six major hurricanes in the course of a 30 year period, two hurricanes in a three week period, and the second most deadly hurricane in U.S. history. The threat of a major breach in the Herbert Hoover Dike looms among the highest concerns of the County and the U.S. Army Corps of Engineers. As a relatively flat, low lying, heavily developed coastal county that experiences frequent intense rain events and periodic tropical storms, Palm Beach County is especially susceptible to inland flooding, coastal erosion and storm surge damage. Concerns over the long-term effects of sea level rise have recently emerged as a priority as well.

These are among the more compelling reasons Palm Beach County has chosen to be a proactive leader in community disaster preparedness, resiliency, and pre-event redevelopment planning. The County's PDRP is one manifestation of this effort.

Origin of Post Disaster Redeveloping Planning in Palm Beach County

Palm Beach County was among the first jurisdictions in Florida to prepare a PDRP (PDRP). The 1996 plan was very rudimentary, narrow in scope, and focused primarily on land use and development issues.

Influenced by the near miss of a Category 5 storm (Hurricane Floyd) in 1999, direct impacts from three Category 2 hurricanes in a two year span (2004 and 2005), and lingering memories of the total transformational devastation caused by Hurricane Andrew in Homestead, Florida in 1992, Palm Beach County's Division of Emergency Management concluded that a more comprehensive actionable guidance document was needed, geared to catastrophic disaster events. In concert with the County's Planning Zoning and Building Department and the Economic Development Office, efforts began in early 2005 to develop an enhanced, more comprehensive guidance document. Treasure Coast Regional Planning Council and an area hazard mitigation planning consulting firm were retained to support the project. The goal of the project was to develop a plan that went beyond State statutory requirements existing at the time to address a full range of challenges and issues that will likely confront community leaders if and when the County suffers a major or catastrophic event. During the course of plan development, Katrina devastated the Gulf region of the U.S., reinforcing the wisdom of the project and providing an unfortunate, but valuable, case study for the project team.

In 2006 the County published and adopted a Countywide PDRP designed specifically to support the difficult decisions and actions that must be made in the chaotic post disaster environment in order to accomplish community long-term recovery, reconstruction and economic redevelopment in a timely and effective manner. The plan also addressed pre-disaster and short-term recovery decisions and actions having long-term implications.

The PDRP is considered to be a cornerstone strategic tool for building a more disaster resilient community and economy.

Post Disaster Redevelopment Plan

Description

A PDRP is a guidance document that identifies and lays out policies, operational strategies, and roles and responsibilities to help guide the decisions and actions of community leaders relative to long-term recovery and redevelopment following a major or catastrophic disaster. In short, it serves as a blue print for rebuilding the physical, social and economic fabrics of our community.

The PDRP also encourages capitalizing on the unique window of opportunity for hazard mitigation and community improvement provided by the post disaster environment, consistent with the goals of the local Comprehensive plan and with full participation of the citizens.

Key recovery and redevelopment topics emphasized in the PDRP include, but are not limited to:

- Business resumption and economic redevelopment
- Housing repair and reconstruction
- Infrastructure restoration and mitigation
- Governance and financial management
- Sustainable land use
- Environmental preservation and restoration, and
- Short-term recovery actions that affect long-term redevelopment

Definitions of terms and acronyms used in this Plan are included in Volume 2.

Purpose

Palm Beach County's Post Disaster Redevelopment Plan (PDRP) is intended to be a *single source reference* to guide action and decision making during the difficult long-term disaster recovery period. It addition, it suggests actions the community can take before disaster strikes to facilitate a more timely, effective and complete post disaster recovery and to use redevelopment as an opportunity to go beyond returning to the status quo to build a more sustainable, disaster resilient community.

Guiding Principles

Long-term community recovery planning should be:

- Action-oriented and support other community plans and policies
- Community driven
- Based on public involvement
- Locally controlled
- Project-oriented
- Incorporate mitigation and community improvement approaches and techniques

Goals and Objectives

Among the primary goals and objectives of the PDRP are the following:

- Establish a vision of how the community wants to rebuild and what it seeks to be and look like in the post disaster environment
- Develop a positive momentum and identity for the recovery
- Optimize self-sufficiency and self-determination, reduce dependency on outside assistance, retain local control over recovery, and speed economic redevelopment through the preferential use of local and regional resources and capabilities
- Present an organized, sellable vision to successfully secure funding assistance and program support
- Effectively secure, direct and manage outside resources and assistance needed from federal, state, private sector and other non-governmental sources
- Lay the foundation for holistic recovery and bolster institutional capacity through: broad engagement of community, regional, state, federal and non-governmental resources; building on collaborative partnerships and initiatives; ensuring an understanding of assistance programs and resources; and establishing productive working relationships with public and private sector organizations within and outside the community
- Effectively identify, address, and plan for the simultaneous coordination of a full range of redevelopment and resiliency issues including business resumption and economic redevelopment, housing repair and reconstruction, infrastructure restoration and mitigation, sustainable land use, environmental preservation and restoration, sustainable jurisdictional governance, and financial management
- Exploit opportunities to build back better and smarter through hazard mitigation and community improvement, consistent with the goals of the local comprehensive plan and with full participation of citizens
- Link and integrate post disaster recovery language, priorities, principles and issues with other community plans, including the Comprehensive Plan, the Comprehensive Emergency Management Plan, the Recovery Plan, the Strategic Economic Development Plan and the Local Mitigation Strategy Plan
- Provide for a seamless transition from disaster response and short-term recovery activities, roles, and responsibilities to those required for long-term recovery and redevelopment
- Effectively integrate and coordinate multi-disciplinary resources, many of whom may be unfamiliar with emergency management protocols, systems, policies, and practices
- Ensure that recovery and redevelopment take place in a manner consistent with community values
- Gather resolve and spirit, progress forward, and heal through the active process of rebuilding together

Benefits

Many benefits accrue from having a Post Disaster Recovery Plan:

- First and foremost, having a prepared plan should promote a faster and more efficient recovery. Creating a process and mechanism to make smart post-disaster decisions and prepare for long-term recovery requirements will enable the community to do more than react, and hopefully facilitate post disaster action while minimizing unproductive, time-consuming confusion and debate. By identifying appropriate planning mechanisms, financial assistance sources, and agency capabilities, roles and responsibilities beforehand, the County should be able to begin the road to recovery more quickly.
- Having a PDRP assists with anticipating issues and capitalizing on opportunities for community improvement beyond rebuilding to the status quo. Without a guiding vision, short-term decisions might otherwise inadvertently restrict long-term, sustainable redevelopment. The PDRP strengthens the recovery process, and allows community leaders to assess risk levels and to craft strategies and plans for long-term redevelopment free of much of the stress and chaos that accompany major disasters.
- The PDRP encourages government officials, residents, and businesses to consider long-term redevelopment goals and develop informed policies and procedures that will guide recovery and redevelopment. While outside resources will be needed and welcomed after a major or catastrophic disaster, a locally developed Plan will help to channel those resources to effectively meet the community's specific needs and goals.

Using This Plan

The PDRP is intended to be a dynamic, living document that will be regularly reviewed and enhanced over time to enrich its practical utility and make it more user friendly for those charged with activating and implementing it.

This edition of the PDRP incorporates several changes made in response to observations of the planning team, feedback from PDRP Executive Committee members and community leaders, and recommendations from a solicited Gap Analysis of the County's 2006 PDRP relative to state PDRP guidelines prepared by the Florida Department of Community Affairs.

With the continuous integration of new information, the PDRP becomes increasingly voluminous and difficult to navigate. Recognizing the varying needs and interests of different user groups, an effort has been made to reorganize the plan to accommodate changes and make it easier for users to locate needed information quickly and drill down to whatever level of detail they need or desire.

The PDRP is now organized into three major volumes:

- Volume 1 - a streamlined activation and implementation support section for local decision makers with references to additional, more detailed information elsewhere in the plan.
- Volume 2 - a detailed technical information section which can be referenced, as needed, to support critical to decisions and actions and to organize recovery and redevelopment efforts. Important guides to resource information, a glossary of terms, and a list of acronyms used in the Plan are provided in the Appendices.
- Volume 3 - an administrative support information section critical to keeping the PDRP current and in line with best practices and containing frequently updated organizational, resource and contact information.

Statutory Guidance

The 2006 PDRP was developed in compliance with Chapter 163 of Florida's Growth Management Act, Rule 9J-5, Florida Administrative Code (F.A.C.), and the Coastal Management Element of the County's Comprehensive Plan.

In its pre-2011 form, Florida's Growth Management Act of 1985 and its subsequent amendments placed a burden on coastal counties to plan and regulate land use and development to protect coastal resources, life, and property. The Act and its implementing regulations contained numerous general and specific requirements which coastal counties were expected to address, including the development and adoption of PDRPs.

In the Spring of 2011 several significant changes in Florida growth management laws were instituted in Tallahassee. Among these changes, Chapter 2011-139, Laws of Florida, revised Section 163.3178, Florida Statutes and eliminated Rule 9J-5, Florida Administrative Code. In so doing, language that explicitly "required" coastal communities to prepare PDRPs was dropped.

The State's Community Planning and Emergency Management divisions, however, continue to encourage and support local jurisdictions involved in or interested in getting involved in the Statewide Post Disaster Redevelopment Planning Initiative to the extent permitted by the remaining, albeit less stringent, guidance provided under Chapter 163.

Recognizing the criticality of having long-term redevelopment plans and the growing national trend toward adopting such plans, Palm Beach County, and most Florida communities, can be expected to continue to support the basic tenets of the Post Disaster Redevelopment Planning Initiative at the local level.

Types and Levels of Disasters

Many of the recovery issues, strategies and actions outlined in this PDRP are applicable to numerous types of disasters which may or may not have long-term implications and impacts. The 2006 PDRP was designed principally for use with the three most probable

major disaster types: intense hurricanes and tropical storms; failure of the Herbert Hoover Dike; and large-scale flooding events.

For the first time, the current plan also includes discussions on sea level rise. Although technically more of an gradually developing threat to land, property, infrastructure, life, the economy, and the environment, than itself a discrete disaster event, sea level rise warrants inclusion in the PDRP based on its significant long-term implications and impacts and the need for strategic long-term planning and preparation. Among the types of disaster incidents likely to result from or to accompany rises in sea level are: increased inundation of low lying lands; shore erosion, loss of coastal structures, infrastructure and habitats; increased flooding and coastal storm surge; saltwater intrusion into critical fresh water sources; and higher water tables.

Detailed discussions on these disasters, including pre-event hazard-specific plans, mitigation and recovery strategies, vulnerability assessments, etc. are contained in the Volume 3.

Technically, the PDRP is useful for all levels of disasters, minor, major and catastrophic. However, because the scale of long-term recovery and redevelopment is almost always proportional to the severity of the damage caused by a disaster, the PDRP is expected to be most valuable with major or catastrophic disasters which affect a large segment of the community or region.

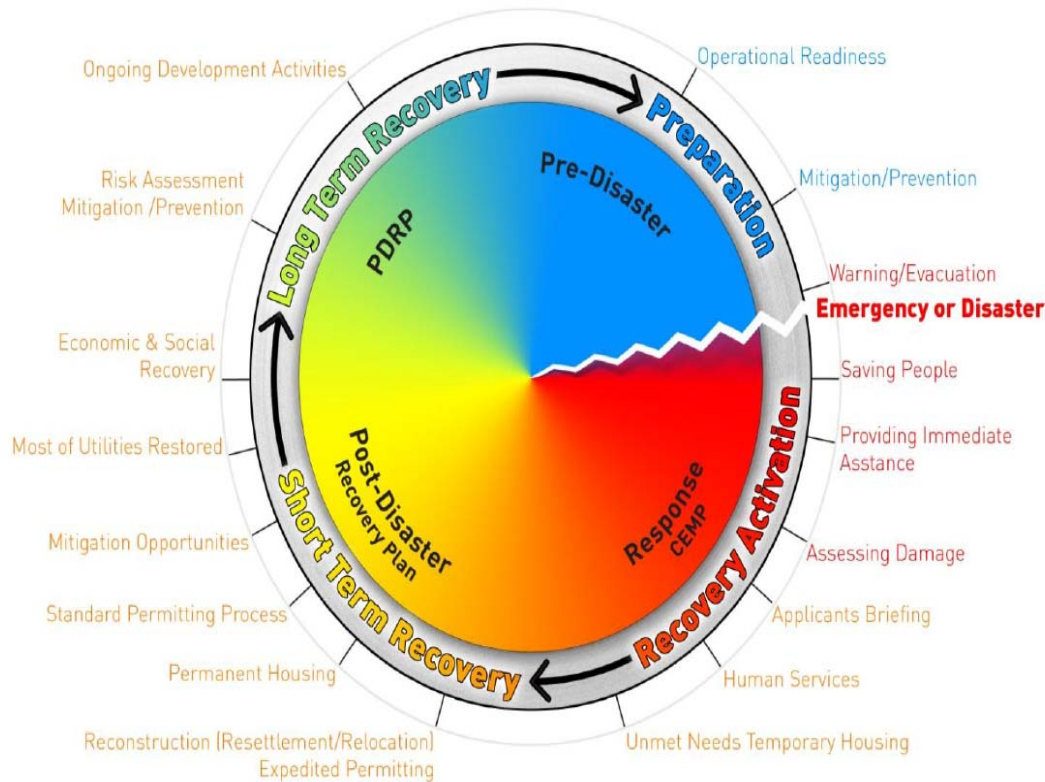
As they require significantly different planning strategies and recovery actions, other potentially major or catastrophic disasters such as highly contagious diseases, acts of terrorism, technological disasters, etc. will be considered for inclusion in future editions of the PDRP.

DISASTER MANAGEMENT PROCESS

Relationship of the PDRP with Other Local Plans

The PDRP is not a stand-alone document. Its scope, guidance and implementation must work effectively with, complement, and support other relevant policy and guidance documents critical to effective disaster management. Appropriate language recognizing linkages with other plans such as the Comprehensive Plan, Comprehensive Emergency Management Plan, Recovery Plan, LMS, and Strategic Economic Development Plan are discussed in Volume 3. The figure below provides a simplistic illustrative depiction of the time-phased relationships with key disaster-relevant plans and representative activities covered by each plan. Overlaps denote key transition and integration points between and among the plans during the different phases of a disaster. While the depicted flow and interactions are useful in understanding the disaster management process, they are neither definitive, fixed, or precise. There can be significant variation from one disaster event to another.

Time Phased Relationship of the PDRP and Other Disaster Management Plans



Short Term Recovery Phase

Short-Term Recovery is the critical time period when life-saving activities have ceased, but survivors remain in a state of uncertainty and transition. While the transition from response to recovery is gradual and not clearly delineated, there are a number of priority activities which signal the predominance of recovery-related activities. During short-term recovery, the goal is to reopen habitable areas by remediating any unsafe conditions, such as severely damaged infrastructure, hazardous materials, downed power lines or unstable structures. Search and rescue operations are ceasing and live recovery is improbable. Debris removal teams have at least completed emergency clearance of roadways to open one lane. Power restoration efforts should be steadily progressing and critical facilities should be operational. The human service goal is to identify survivors with long-term displacement needs and move them from emergency and transitional shelters to more appropriate and sustainable temporary solutions, such as rental properties and mobile housing units. Enhance transportation services may be required to return evacuees from emergency shelters to alternate locations, such as interim housing, places of employment, schools, etc. Persons with special medical, physical, and/or mental health needs may require additional assistance, such as transportation. During the Short-Term Recovery Phase, the Recovery Operations Center will seek to deactivate most immediate short-term life supporting systems which may no longer be essential such as shelters, mobile feeding sites, comfort stations, and mutual aid support crews. Key priorities for short-term recovery include: restoring government

service, repairing public facilities and infrastructure, providing short-term assistance to individuals and families, helping residents resume basic, routine activities, restoration of essential goods and services, providing emergency housing, and identifying immediate emergency funds for individuals, businesses and the government, such as bridge loans.

The Recovery Steering Committee will transition to the Post Disaster Redevelopment Executive Committee and implement the policies detailed in the PDRP.

Long-Term Recovery

Long-term recovery is the protracted phase of recovery that follows short-term recovery. Recovery actions during long-term recovery are increasingly guided by the Post Disaster Redevelopment Plan and focus on more permanent, sustainable solutions, reconstruction of the community's destroyed or damaged physical features, a return to viability through the repair, restoration and revitalization of the social, economic and political processes, institutions and relationships damaged by the disaster, and exploitation of opportunities to rebuild better, stronger and smarter. The goal underlying long-term redevelopment is moving the community toward self-sufficiency, sustainability, self-determination and greater disaster resilience. Long-term recovery activities may continue for years or decades depending on the severity and extent of the disaster damages and the availability of resources.

Key Goals of Long-Term Community Recovery

- Identify risks that affect long-term community sustainment and vitality.
- Rebuild to appropriate resilience standards in recognition of hazards and threats.
- Address recovery needs across all sectors of the economy and community, with an emphasis on individual and family recovery activities and unmet needs.
- Rebuild educational, social, and other human services and facilities according to standards for accessible design.
- Reestablish medical, public health, behavioral health, and human services systems.
- Reconfigure elements of the community in light of changed needs and opportunities for “smart planning” to increase energy efficiency, enhance business and job diversity, and promote the preservation of natural resources.
- Implement mitigation strategies, plans, and projects.
- Implement permanent housing strategies.
- Reconstruct and/or relocate, consolidating permanent facilities.
- Implement economic and business revitalization strategies.
- Implement recovery strategies that integrate holistic community needs.
- Implement plans to address long-term environmental and cultural resource recovery.
- Ensure there is an ongoing and coordinated effort among local, state, and federal entities to detect and deter waste, fraud and abuse.
- Identify milestones for the conclusion of recovery for local entities.

Successful Community Recovery

Communities define successful recovery outcomes differently based on their circumstances, challenges, recovery visions and priorities. One community may characterize success as the return of its economy to pre-disaster conditions; while another may see success as the opening of new economic opportunities. Although no single definition of a successful recovery can fit all situations, successful recoveries do share a common condition in which the community successfully meets its priorities to overcome the impacts of the disaster, reestablishes an economic and social base that instills confidence in the local citizens and businesses regarding the community's viability, and rebuilds the community to be more resilient from future disasters.

The establishment of viability in the present and for the future is the critical variable that defines community recovery. Viability means the community has a developmental trajectory projected to result in continued self-sufficiency and its institutions are coping with and adapting to changing circumstances. Successful recovery also assumes the condition of the post disaster community is generally acceptable to a critical mass of the residents.

The extent of recovery should not be measured by how closely the post-event community resembles the pre-event community. Things never return to what they were before the disaster event.

Because neither individuals nor neighborhoods recover at the same pace or in the same pattern, establishment of a clear timetable for long-term recovery is unproductive.

PDRP Planning Process

The PDRP update and enhancement project followed similar methodologies consistent with the state's *Post-Disaster Redevelopment Planning: A Guide for Florida Communities* released in early 2010, including the pilot integration of sea level rise adaption strategies commissioned by the Florida Department of Community Affairs and the Florida Division of Emergency Management. The sea level rise integration piece was spearheaded by a regional consulting group working closely with County members of the South Florida Climate Change Compact. Special technical advisory committees were formed to capitalize on subject knowledge in eight (8) key areas:

- Land Use – Chaired by Planning, Zoning and Building
- Public/Private Infrastructure & Facilities – Chaired by Engineering and Facilities Management
- Economic Redevelopment – Chaired by Economic Development Office
- Housing Recovery – Chaired by Housing and Community Development
- Health & Human Services – Chaired by Community Services, Palm Beach County Health Department, and Disaster Recovery Coalition
- Environmental Preservation & Restoration – Chaired by Environmental Resources Management
- Governance & Financial Administration – Chaired by County Administration
- Infrastructure and Public Facilities – Chaired by Facilities & Engineering

Additional information on the PDRP planning process is contained in the Administrative Support Section.

PDRP ACTIVATION

This section describes when and how the PDRP is activated. Activation officially launches the County's long-term recovery process and authorizes the commitment of resources to implementing the actions outlined herein.

Triggers/Considerations

A number of factors will be considered in decisions regarding if and when to activate the PDRP. These include, but are not limited to:

1. Type and magnitude of the disaster:
 - By virtue of the damages that can be anticipated from Category 3, 4, and 5 hurricanes landfalling in Palm Beach County, PDRP activation is a virtual certainty. The issue is not 'if,' but "when" to activate the PDRP. Given the lead times involved, partial plan activation might begin even before landfall.
 - Plan activation decisions for hurricanes of lesser intensity and other forms of disasters will be more dependent on post event damage assessments.
2. Situational considerations such as:
 - The status of short-term recovery efforts that clear the way for long-term recovery.
 - Availability and readiness of governmental resources that can be productively mobilized and committed to administering long-term recovery.
 - If a local, state and/or Presidential declarations, memos of understanding, etc. necessary to qualify the County for outside assistance, executed and is in place.
 - If institutional capacity levels are sufficient to meet the long-term recovery and redevelopment requirements for this event, and have been fully assessed
 - If reliable, all inclusive, assessments of damages have been developed in sufficient detail and form and can be used to justify assistance and ensure eligibility for compensation.
3. Timing considerations such as:
 - If long-term recovery efforts can be thwarted or rendered ineffectual by further escalation of disaster damages or cascading physical, social, economic or political impacts.
 - How pressing are the needs to initiate long-term recovery actions (e.g., meeting windows of opportunity or otherwise qualifying for assistance)?
 - Are the tasks necessary to meet short-term recovery requirements and priorities sufficiently complete to free resources for long-term recovery responsibilities.
4. Availability and readiness of community resources:

- Status of local governmental, private sector, and non-governmental resources and capabilities.
- Status of regional resources and capabilities.
- 5. Opportunities for securing outside financial and non-financial assistance:
 - Are federal, state and other assistance services and funds available for long-term recovery? Is there a sufficient window of opportunity available for securing these services and funds?
 - Are National Disaster Recovery Framework (FEMA ESF #14 long-term community recovery) services available and appropriate?
 - Are non-governmental organizations positioned to initiate long-term recovery assistance?

PDRP Activation Decision Authority

Recommendations relating to activation of the PDRP will generally come from members of the PDRP Executive Committee participating on the Recovery Steering Committee during the early recovery phase as described in the Recovery System Organizational Structure section (page 12) of the *Palm Beach County Recovery Plan* and/or from the Deputy County Administrator. Final authority for activation ultimately rests with the Board of County Commissioners, the County Administrator or Deputy County Administrator.

Implementation of pre-disaster actions called out in the PDRP does not require activation of the plan. Pre-disaster actions and initiatives can be initiated by Working Groups themselves unless special resources requiring approvals are involved.

PDRP Activation Process

Most often, decisions as to if, when and to what level the PDRP should be activated will be based on the magnitude, scope and type of damages suffered, the status of stabilization and early recovery efforts, and considered assessments of available long-term recovery resources and capacity. In the case of slow emerging disasters such as intense hurricanes, PDRP activation may be anticipated well in advance of the actual event itself.

When, in the collective opinion of those involved in short term recovery efforts, a consensus emerges that it may be time to activate all or part of the PDRP, the PDRP Executive Committee will be convened to discuss the timing and strategy for formally launching long-term recovery actions. The Executive Committee will prepare a formal position statement for presentation to the Deputy County Administrator and the Board of County Commissioners.

Upon official approval to activate the PDRP, all members of the Executive Committee will be notified and Work Groups charged with implementing actions in key recovery areas will be convened.

Assuming appropriate declarations are in place and communications have been opened with state and federal agencies in accordance with the *National Disaster Recovery Framework*, formal requests for state and federal assistance will be prepared and submitted with the assistance of the Local Disaster Recovery Manager (Deputy County Administrator), the State Disaster Recovery Manager (if assigned) and the Federal Disaster Recovery Coordinator (if designated).

More detailed information on the PDRP activation process and the organizational and functional transition from the Recovery Plan to the PDRP are presented in Volume 2.

At a minimum, the following individuals and organizations will be promptly notified of PDRP activation and provided regular recovery status reports and plans:

- Board of County Commissioners
- County Administrator
- Deputy County Administrator
- Members of the PDRP Executive Committee
- All working group members
- Community EM and Recovery stakeholders and partner organizations
- Municipal governments
- Regional governments
- Florida Department of Economic Opportunity
- Florida Division of Emergency Management
- FEMA Region IV
- Federal Disaster Recovery Framework principals and partner organizations
- Palm Beach County residents and businesses
- Palm Beach County and regional private sector partners
- Non-governmental partners and organizations (e.g., Disaster Recovery Coalition)
- U.S. Chamber of Commerce/Business Civic Leadership Center

Types and Levels of Disasters

Although this PDRP is intended to be an “all hazards” guide, its language clearly reflects a heavy emphasis on hurricanes. Hurricanes provide perhaps the most useful frame of reference for a full range of impact levels. In general, however, the guidance offered in the plan will apply to a full range of disaster types.

It is anticipated the PDRP will be most likely activated and implemented for events involving:

- Major hurricanes
- Failure of the Herbert Hoover Dike
- Large-scale flooding events

Although clearly not a disaster event in the traditional sense, sea level rise will likely produce critical consequences in the form of progressive events that will impact broad segments of the county. These consequences include increasingly higher storm surge

inundation, encroaching damages from coastal erosion, salt water intrusion into critical fresh water sources, increased inland flooding from reduced drainage capacities, etc.

Commonly used definitions of levels of disasters include:

- "Catastrophic disaster" a disaster that will require massive state and federal assistance, including immediate military involvement
- "Major disaster" a disaster that will likely exceed local capabilities and require a broad range of state and federal assistance
- "Minor disaster" a disaster that is likely to be within the response capabilities of local government and to result in only a minimal need for state or federal assistance

The following chart provides some subjective guidance for deciding if a minor, major, or catastrophic disaster has occurred. These descriptions are not meant to provide legal authority or replace any established disaster definitions, but should be useful in suggesting decision points and actions to take based on the magnitude of impact.

Common Characteristics of Catastrophic, Major, Minor Disasters

CATASTROPHIC DISASTER	MAJOR DISASTER	MINOR DISASTER
<i>Most likely would be caused by:</i>		
Category 4 or 5 hurricanes: Winds 131 MPH and higher, Surge 13 feet and greater <i>A direct hit by storms of this magnitude will cause immense destruction in the County. Significant human toll.</i>	Category 2 and 3 hurricanes: Winds between 96 and 130 MPH, Surge between 6 and 12 feet. <i>A direct hit will cause substantial physical damage. Relatively little loss of life.</i>	Tropical Storms and Category 1 hurricanes: Winds up to 95 MPH, Surge up to 5 feet. <i>A direct hit will cause scattered light physical damage. Loss of life unlikely.</i>
Large-scale failure of Herbert Hoover Dike	Significant failure of Herbert Hoover Dike	Minor failure of Herbert Hoover Dike
Large-scale flooding (highly unlikely)	Substantial area or scattered flooding	Significant localized flooding
<i>May exhibit some or all of the following:</i>		
Approx. \$50 billion or more in estimated losses. TAOS models of the County calculate Cat. 4 & 5 storms will cause this much in surge and wind damages. (Palm Beach County, 2004)	Between \$10 and \$50 billion in damages, approx. The TAOS model calculates the dollar figures through a comparison of parcel data with wind and storm surge damage from Category 2 and 3 hurricanes. (Palm Beach County, 2004)	Up to approx. \$10 billion in losses. With so much population and development concentrated on the coast, damages are difficult to avoid. However, the TAOS model calculates that a Category 1 storm is likely to have a far reduced amount of property impact. (Palm Beach County, 2004)
More than 25% of housing is destroyed or not habitable. With such a severe reduction in housing stock much of the population will at least temporarily relocate. This could lead to workforce shortages which slow economic recovery and reductions in the tax base which limit local governmental functions.	5-25% of housing is destroyed or not habitable. A greater percentage of the population can return from evacuation, however shelters will remain overburdened. Also, some workforce shortages will slow recovery efforts.	<5% of housing is destroyed or not habitable. Population displacement is not as extreme. Citizens are easily able to return from a local shelter or short evacuation. Issues of repopulation and employee loss are minimal.
Most or all of the community's structures are impacted in some way. This places a strain on the construction industry and local government building and planning staff, as well as making it difficult for anyone to return to normal daily operations.	A majority, but not all, of the built structures are impacted. With a reduced number of impacted structures, reconstruction crews can make repairs quicker and since more habitable structures remain, repopulation can occur more quickly.	Less than half of all built structures are impacted in any way. Local contractors are able to handle the repair and construction demands. Residents can return to or remain in their homes.
Most government operational centers are inoperable and County EOC operations are severely impacted. This causes an organizational hurdle for recovery operations. Government should provide assistance	Government operational centers are severely impacted and County EOC is partially impacted. The EOC can remain the center of operations with minor repairs, however, other government locations will need work before they can be reopened causing	Government operational centers are slightly impacted, but operational. Public facilities will remain fully operational and experience few effects from Category 1 hurricanes or tropical storms.

CATASTROPHIC DISASTER	MAJOR DISASTER	MINOR DISASTER
to citizens in a time of need, but when they are also victims the response effectiveness is hampered. More than 75% of electric utilities are inoperable for 4 or more days. Electricity outages affect residents' everyday life and limit commercial activity. Without electricity, street lights are inoperable and curfews continue to be enforced. Non-functioning traffic signals are also a hazard and consume police personnel hours. Communication is not operational due to damaged telecommunications systems. Severely hampers recovery activities. All utility companies will be affected by a lack of personnel and reliant on outside help. Extensive shortages of water and extended "boil" orders as well as environmental impacts from sewer system failures. Lack of potable water is a major inconvenience for residents and boil water notices are often confusing for the public. Sewer system failures pollute waterways and require beaches to be closed. Roadways, railroads, and airports are severely damaged, public transit is not in service for 10+ days, and gas shortages are widespread for 4+ days. Transportation disruptions prevent the inflow of supplies, slow the response times of those providing assistance, and stop citizens from returning to work. Local inter-governmental assistance is not an option. The size of the event and range of its impacts prevent neighboring jurisdictions from assisting. Distant or out-of-state personnel must be called upon.	a delay in services. 50 - 75% of electric utilities are inoperable for 4 or more days. Telecommunications are heavily damaged, but remain partially operational. Fewer electrical outages or those lasting fewer days mean fewer inconveniences, safety hazards are reduced and work crews can correct the problems quicker than during a catastrophe. However, a great amount of external personnel will be utilized to repair both systems. Some impacts to water utilities and limited sewer system failures. Boil water orders are required for limited portions of the population and are short in duration. Some pump stations are temporarily down. Transportation is largely functioning within a week, once debris is cleared and minimal repairs complete. Response supplies can reach the destination with minor delays. Debris removal and sufficient employee power are the major impediments to restoring transportation operations. Inter-governmental assistance must be utilized to fill personnel voids. Mutual aid agreements will be utilized. Personnel cannot come from neighboring jurisdictions, but does not require out-of-state entities.	0 – 50% of electric utilities are inoperable for 4+ days. Telecommunications are disrupted intermittently throughout the clean up process. Public safety concerns are nearly non-existent. The major concerns are those of convenience, but local crews can quickly restore power to the grid.

PRIMARY HAZARD VULNERABILITY ASSESSMENTS AT A GLANCE

Hurricanes

Overall Assessment: ➤ High probability ➤ High risk ➤ High impact ➤ Significant probability for major/catastrophic consequences	Population at Risk: ➤ 1.3 million ➤ 88% live within 10 miles of the coast
Previous Occurrences: ➤ 24 hurricanes within 60 miles of Palm Beach 1900 – 2010 ➤ 11 direct hits; 5 back to back; 8 brushes ➤ 2 Category 4 and 2 Category 3 storms ➤ Strongest sustained winds: 150 mph ➤ No recorded storms of Category 5 intensity ➤ Floyd would have exceeded 150 mph winds had it made landfall	Risks to Life/Safety: ➤ Significant ➤ Particularly special needs population, elderly, poor, homeless
Likelihood of Future Occurrences:	Structures/Infrastructure at Risk: ➤ 86% of 310,600 residential structures reside within 10 miles of coast ➤ 93% of 2,146 non-residential structures reside within 10 miles of coast ➤ 353 critical facilities are at risk ➤ 13% of residential and non-residential are located within evacuation zone
Areas at Greatest Risk: ➤ Entire County; coastal and western lake communities have highest risk	Economic/Social Impacts: ➤ Tremendous ➤ Exposure could exceed \$100 billion
	Environmental Impacts: ➤ Far reaching ➤ Coastal species/habitats particularly vulnerable

Inland Flooding

Overall Assessment:

- High probability
- Moderate risk
- Moderate to low impact
- Low to moderate probability for major/catastrophic consequences

Previous Occurrences:

- Over a third of Florida's declared disasters involve flooding
- Palm Beach County recorded 25 significant flood events between 1947 and 2009
- The National Climate Data Center lists 17 County flood events during the period 1950 to 2009 on their "severe flood events list."
- Several years between 1978 and 1995 experienced in excess of 80 inches of rain, causing extensive flooding

Likelihood of Future Occurrences:

- High probability of flash flooding from intense rain events
- High probability of flooding from tropical storm events
- County has highest rainfall levels in South Florida
- Average time between significant flooding events is 2.3 years
- Several years have experienced multiple flood events
- The best predictors available are flood zone designations assigned by the NFIP
- Zone A areas have the greatest risk; Zones B, C, and X have somewhat lower risks

Areas at Greatest Risk:

- Entire county susceptible because of flat terrain and widespread water bodies
- Significant flooding occurs outside designated Special Flood Hazard Areas
- Eastern communities flood more than central and western communities

Population at Risk:

- Flash flooding tends to be scattered and a risk only to a few neighborhoods at a time

Risks to Life/Safety:

- Low to moderate risk
- Drowning from inland flooding is rare in Palm Beach County
- Life/safety risks associated with pooling more than water movement; electrocution
- Street flooding can create dangerous driving conditions; some isolated deaths from accidentally driving into canals
- Overflow of wastewater and septic systems can produce health problems

Structures/Infrastructure at Risk:

- In-structure inland flooding is not widespread; most homes built on elevated pads
- Street and yard flooding is common; isolation and loss of function can be problems
- There are approximately 280 repetitive flood loss properties countywide, most widely scattered throughout the eastern corridor
- The most flood prone areas: northern and central communities; barrier islands.
- Zone A structures have a 26% chance of flooding over the life of a 30 year mortgage

Economic/Social Impacts:

- Significant if there is widespread flooding
- Loss of commercial access can be costly

Environmental Impacts:

- Low to moderate

Dike Failure

Overall Assessment:

- Moderate to high probability
- High risk
- High impact
- Significant probability for major/catastrophic consequences

Previous Occurrences:

- 1926 Category 4 hurricane caused overtopping (killed 300)
- 1928 Category 4 hurricane caused massive failure (official 2,500 deaths; more likely 5,000-6,000)
- 1947 near catastrophes from two hurricanes
- 2004 & 2005 three Category 2 storms caused minor structural damage to the dike

Likelihood of Future Occurrences:

- Army Corps cautions that a failure could be imminent without mitigation and management of lake levels
- 2007 USACE report stated 50% chance of breach within 3 years and virtual certainty within 5-7 years without intervention.
- Cut wall now installed in most of Reach1 has reduced risk of wall failure
- Category 1 to Category 4 hurricanes a virtual certainty
- Return period all storms: 6.57 years
- Return period major hurricanes (Category 3 or higher): 13 years

Areas at Greatest Risk:

- Western communities (Belle Glade, Pahokee, South Bay, Canal Point)
- Potential to reach western boundary communities of the eastern corridor (Wellington, Royal Palm Beach, Loxahatchee); inundation models still being developed by USACE

Population at Risk:

- 40, 000 residents of western communities; unknown number of transient workers
- Ranked second most vulnerable area to hurricanes in the U.S. (behind New Orleans) in 2006 by the International Hurricane Research Center study

Risks to Life/Safety:

- Significant
- Particularly special needs population, elderly, poor, migrants, prisoners. non-evacuees

Structures/Infrastructure at Risk:

- 4,850 residential structures estimated to be at risk
- 761 non-residential structures estimated to be at risk
- 10 critical facilities are at risk

Economic/Social Impacts:

- Potentially significant loss of agricultural lands and crops
- Death toll likely to be significant because of anticipated low voluntary evacuation rates

Environmental Impacts:

- Far reaching
- Coastal species/habitats particularly vulnerable

Sea Level Rise

Overall Assessment:

- High probability of continued rise; uncertainty on rate of change
- High risk of long-term consequences
- High potential impact
- Significant probability for eventual major/catastrophic consequences

Previous Occurrences:

- Steady but marginal rise has been measured
- Progressive development of coastal erosion and salt water intrusion are concerning; could increase vulnerability to sea level rise-associated consequences

Likelihood of Future Occurrences:

- Continued gradual sea level rise appears to be a certainty in the near term
- Some scientists believe the rate of rise will increase; no local evidence of that yet
- Highly divergent projections on rates of rise

Areas at Greatest Risk:

- 23 of the county's 38 municipalities are susceptible to the effects of sea level rise
- Municipalities bordering the Atlantic Ocean and Intracoastal Waterway are at greatest risk
- Jupiter, Singer Island and area from Lake Worth Pier to Lantana are erosion hot spots
- The cost, effectiveness, and responsibilities of beach and dune re-nourishment are under question
- SFWMD estimates that salt water intrusion already reaches 3 miles inland along some parts of coast (Lantana, Lake Worth and Manalapan are front line defense)

Population at Risk:

- Populations on the barrier islands and in areas contiguous to the ocean and coastal waterways are at greatest risk

Risks to Life/Safety:

- Low in near term
- Expanded threat of coastal storm surge could become a problem without adaptation measures

Structures/Infrastructure at Risk:

- Structures/infrastructure on coastlines in erosion areas are at greatest near-term risk
- Some structures are already at risk of collapse

Economic/Social Impacts:

- Beach re-nourishment and dune restoration costs will continue to mount
- Significant future investments in desalination technologies likely to be required
- Adaptation and retreat measures will be costly
- Insurance will become increasingly cost prohibitive or unavailable

Environmental Impacts:

- Far reaching
- Coastal species/habitats particularly vulnerable
- Vast freshwater wetlands could become saltwater marshes
- Threat to rare and endangered habitats indigenous to Florida for which there is no opportunity for inland migration
- Salt water intrusion into sole source Biscayne Aquifer may require investments in desalination technology

Key Post Disaster Subject (Issue) Areas

It is impossible to predict all of the issues that will need to be addressed as part of the long-term recovery and redevelopment process. Each disaster will present different challenges. However, the following subject areas invariably predominate community, long-term recovery decision making and actions following major disasters and are singled out for emphasis in this PDRP.

Governance & Financial Administration: Continuity of essential governmental functions and services and competent management of local financial matters and outside financial assistance are central to long-term community recovery. These tasks will be especially challenging given the number, interdependencies, and financial vulnerabilities of the County's many jurisdictional entities.

Economic Redevelopment: Community disaster recovery hinges largely on how quickly and effectively the local economy can be rebooted and returned to viability. Economic redevelopment is a complex process beyond the reach of traditional governmental decisions and actions, requiring significant participation of the private sector as the primary basis for jobs, essential goods and services, and tax revenue.

Health & Social Services: The community's capacity to meet the increased needs for health, public safety, and social services peak during the short-term recovery period, but will continue well into the long-term recovery process. The economically and socially vulnerable segments of the population (particularly the elderly, very young, disabled, and poor) invariably are the most severely impacted and will present the greatest challenges.

Housing Recovery: Assuming a large percentage of the County's housing stock is destroyed or badly damaged, a significant portion of the population will need assistance on such issues as locating transitional or permanent housing, understanding and navigating assistance programs, resolving insurance claims, deciding if and when to rebuild, finding reputable contractors, dealing with rebuilding protocols, understanding renters rights, etc.

Land Use: Post disaster decisions on land use will be among the most difficult, politically charged and contentious issues faced during the long-term recovery process. Invariably the challenge boils down to rebuilding quickly or seizing the opportunity to rebuild in a manner which breaks the "build-rebuild" cycle and increases community resiliency to future disasters. Tourism and development considerations will be central.

Environmental Restoration: Palm Beach County's quality of life is tied inextricably to its rich environmental resources and beauty. As a priority in the long-term recovery process, environmental restoration extends well beyond quality of life issues to encompass the full range of benefits derived from healthy ecosystems (water, food, clean air, protection from natural events, etc.) to minimization of environmental degradation caused by the recovery and rebuilding process... The process of environmental restoration will be greatly complicated and slowed by the myriad of interests that must

be addressed and accommodated (political, regulatory, biotic, financial, public relations/media, legal, etc.).

Public Outreach: Communication in all quarters and all levels is the cornerstone for coordinating long-term recovery efforts. Unfortunately, major disasters all too often breed communication breakdowns in the form of no information, misinformation, conflicting information, media hype, blaming, disputes, open dissatisfaction with the pace and equity of recovery, political posturing, etc. Local media coverage can become overshadowed by the presence of the national media, unfiltered or poorly filtered and screened electronic media, and an overemphasis on dramatic negative stories. The open, timely sharing of information and involvement of the public in redevelopment activities will be essential to building confidence and trust.

Public-Private Infrastructure & Facilities: Rapid restoration of infrastructure and public facilities are key priorities to establish within the County's response and short-term recovery processes. In addition, long-term considerations for infrastructure restoration will need to be weighed in conjunction with land use, environment, housing, and economic redevelopment issues. Exploiting opportunities for upgrading, mitigating and relocating infrastructure and public facilities should be an integral piece of building a more disaster resilient community.

As more than 80% of the County's critical infrastructure is owned and/or operated by the private sector, pre and post disaster public-private partnerships which support the continuity plans, decisions, and actions of these operations is vital to both post disaster recovery and future resiliency.

PDRP Deactivation

The PDRP Executive Committee will continuously monitor recovery and redevelopment progress. When, in their judgment, critical post disaster actions and initiatives contained herein and other actions identified and implemented post disaster have been completed to a level that no longer requires the Committee's ongoing direct involvement and oversight, the Executive Committee may recommend full or phased partial deactivation of the PDRP to the Local Disaster Recovery Manager (Deputy County Administrator). The decision to deactivate the PDRP ultimately rests with the Board of County Commissioners. Certain aspects of the long term recovery and redevelopment process will likely continue beyond PDRP deactivation.

PDRP IMPLEMENTATION THROUGH WORKING GROUPS

Long-term post disaster community recovery and redevelopment requires the simultaneous involvement, contributions and coordinated interactions of a broad range of highly diverse public and private sector stakeholder organizations. The task of coordinating and managing this maelstrom of highly diverse activities amidst the chaotic backdrop of a major disaster far exceeds the abilities and authorities of any single local entity.

A flexible organizational structure utilizing “Working Groups” has been developed to focus resources and expertise on key, common aspects of the disaster recovery process and to carry out the specific actions outlined in this PDRP.

Each working group is comprised of community leaders (both public and private sector) with specialized knowledge and experience relevant to the group’s assigned area of responsibility. The number, size and composition of each working group and the level and type of its activities are tailored to the specific challenges facing the group. While each working group represents specialized skill sets tailored to its mission, it must coordinate closely with other working groups to achieve optimum efficiency and results, avoid duplication and incompatible actions, and ensure equitable and fair solutions. At the same time some semblance of a hierarchical structure is necessary to ensure resources are appropriately allocated to meet community priorities and to capitalize on the limited windows of opportunity provided by outside assistance organizations.

Key elements of this organizational framework are depicted in the PDRP Working Group Organization Structure in the figure below. In brief, the primary organizational elements and their responsibilities include:

PDRP Executive Committee

The PDRP Executive Committee, a derivative of the Recovery Steering Committee during the short-term recovery process is ultimately responsible for overseeing and coordinating implementation of the PDRP. As a group, and by virtue of their other organizational and function responsibilities, the Executive Committee will meet only when circumstances dictate. However, based on critical subject expertise and decision making authority, certain members of the Executive Committee are tasked with chairing or co-chairing working groups.

Working Groups

Working groups are the key implementers of the PDRP in each of the key subject areas. Their actions and decisions will most directly determine the pace and success of the overall community recovery process. Working groups almost certainly will be required to go beyond the recovery and redevelopment action items specified in the PDRP.

The membership of each working group is set up to be flexible so that as special expertise is needed on a particular task or staff turnover changes membership, the working group can adjust and still function effectively. The working group’s main purpose during implementation is to assign actions to appropriate group members and partners for execution. Working group membership shall be reviewed and adjusted periodically or as necessary prior to a disaster event (e.g., before each year’s hurricane season). Membership will be reevaluated following a disaster to ensure pre-designated members are available and prepared to work.

Working groups will work independently and collectively, as necessary, to deal with post disaster issues and to take on recovery and redevelopment tasks and projects.

Municipal representation in working group activities will be coordinated by the group chairpersons, directly and through the League of Cities. Private sector involvement will be coordinated through the Private-Public Partnership, Chambers of Commerce and other business and professional organizations. Most NGO and CBO participation will be coordinated through the Disaster Recovery Coalition.

The Working group Chair(s) decides when and how often his or her working group needs to meet, although, obviously, during activation of the PDRP there will be a need to meet with greater frequency.

Each working group will be responsible for monitoring its progress toward implementing its assigned tasks and providing regular status reports to the Executive Committee.

Redevelopment Task Force

The Redevelopment Task Force is an ad hoc group comprised of the chairpersons and members of the various working groups. Its purpose is to offer opportunities for the working groups to coordinate their actions, share critical information, ensure concurrence on planned and necessary decisions and actions, and provide inter-group support and assistance. The Task Force will take unresolved matters and decisions beyond their authority levels to the Executive Committee. The Task Force also will provide a direct interface with state, federal, non-profit, voluntary, private sector and other assistance organizations.

The following chart depicts this organizational concept for PDRP implementation at the local level through working groups.

PDRP Working Group Organizational Elements



OVERVIEW OF PRIMARY AREAS OF FOCUS AND MEMBERSHIP

Executive Committee Responsibilities & Membership

The Executive Committee, not to be confused with the Recovery Steering Committee cited in the County's *Disaster Recovery Plan*, is comprised of a select multi-disciplinary team of senior level county and municipal governmental leaders, private sector and non-governmental organization representatives and other community stakeholders critical to long-term recovery and redevelopment. As long-term recovery becomes a major priority, many of the members of the PDRP Executive Committee, who also have served (or may concurrently continue to serve) on the Recovery Steering Committee, will be needed to complete ongoing shorter term recovery activities. To minimize confusion and to distinguish its mission and member makeup from that of the Recovery Steering Committee, the longstanding name PDRP Executive Committee was adopted rather than trying to explain the merging and transformation of the two groups.

Collectively, the PDRP Executive Committee possesses the authority, unique technical expertise, resources and experience critical to planning, coordinating and executing all critical aspects of long-term recovery and redevelopment countywide.

The Committee is charged with overseeing, monitoring and directing long-term recovery, redevelopment and mitigation activities, advising the Board of County Commissioners and municipal councils on a full range of issues, and making and/or recommending operational decisions on behalf of the County. Certain members of the Executive Committee or their designees will be asked to serve as Chairpersons on Working Groups within their areas of expertise and offer guidance and assistance as appropriate. The Executive Committee will also play a key role in coordinating with State and Federal agencies on long term recovery matters.

Once the PDRP is activated, the Executive Committee will meet to prepare a work plan for the post-disaster period based on the best assessments available at that time. Regular meetings of the Task Force will be needed throughout the post disaster period to guide implementation, adjust work plan schedules, and evaluate the progress of Working Groups. The number and timing of meetings will be left to the discretion of the Committee Chairperson.

At a minimum, the following functions and organizations will be represented in the standing membership of the PDRP Executive Committee. Membership will be adjusted, as appropriate, to accommodate personnel changes and situational priorities. A list of current Committee members by name can be found in Volume 2 of the PDRP.

PDRP Executive Committee (Standing Committee Members)

COUNTY DEPARTMENT REPRESENTATIVES

DEPUTY COUNTY ADMINISTRATOR (CHAIR)
DIRECTOR, PLANNING DIVISION
EXECUTIVE DIRECTOR, PLANNING, ZONING, & BUILDING
DEPUTY DIRECTOR, FACILITIES DEVELOPMENT & OPERATIONS
ADMINISTRATOR, FIRE AND RESCUE
DIRECTOR, BUILDING DIVISION
DIRECTOR, HOUSING & COMMUNITY DEVELOPMENT
DIRECTOR, DEPARTMENT OF ECONOMIC SUSTAINABILITY
DIRECTOR, HOUSING & FINANCE AUTHORITY
DIRECTOR, PURCHASING
DIRECTOR, DIVISION OF EMERGENCY MANAGEMENT
DIRECTOR, DIVISION OF HUMAN SERVICES
DIRECTOR, ENVIRONMENTAL RESOURCE MANAGEMENT
DIRECTOR, ENGINEERING & PUBLIC UTILITIES

COUNTYWIDE ORGANIZATION REPRESENTATIVES

DIRECTOR PLANNING & ENVIRONMENTAL PROGRAMS SWA
DIRECTOR, TOURIST DEVELOPMENT COUNCIL
HOSPITAL ADMINISTRATORS
CHIEF OF FACILITIES, PALM BEACH COUNTY SCHOOL BOARD
CHAIR, PALM BEACH COUNTY PRIVATE-PUBLIC PARTNERSHIP
PRESIDENT, BUSINESS DEVELOPMENT BOARD
EXECUTIVE DIRECTOR, PALM BEACH COUNTY LEAGUE OF CITIES
DIRECTOR, PALM BEACH METROPOLITAN PLANNING ORGANIZATION DIRECTOR
DISASTER RECOVERY COALITION

MUNICIPAL REPRESENTATIVES

The Redevelopment Task Force Responsibilities and Composition

The Redevelopment Task Force is comprised of the chairpersons and members of the various working groups. As indicated earlier, its purpose is to offer an opportunity for the working groups to coordinate their actions, share critical information, ensure concurrence on planned and necessary decisions and actions, and provide inter-group support and assistance. The Task Force will take unresolved matters and decisions beyond their authority levels to the Executive Committee. The Task Force will provide a direct interface with state, federal, non-profit, voluntary, private sector and other assistance organizations.

Pre-disaster Responsibilities: The Redevelopment Task Force will meet on an annual basis prior to the start of the hurricane season to review work done by the Stakeholder Group and PDRP Staff throughout the year and decide on recommendations for the county commission and municipal councils regarding planning budget and implementation.

Post-disaster Responsibilities: The Redevelopment Task Force is responsible for advising the Board of County Commissioners and municipal councils on a wide range of post-disaster recovery, redevelopment, and mitigation issues. Once the PDRP is activated the Task Force will convene to develop a work plan for the post-disaster period based on the best assessments at that time. Regular meetings of the Task Force will be needed throughout the post disaster period to guide implementation, adjust work plan schedules, and evaluate progress. Due to the uncertain nature of post-disaster conditions, the number and timing of meetings will be left to the discretion of the Task Force Chairperson.

To carry out this function, the Task Force will have the following responsibilities:

- Review the nature of damages, identify and evaluate alternate program objectives for repairs and reconstruction, and formulate recommendations to guide recovery.
- Review alternative strategies and actions for implementing post-disaster actions and recommend the internal and external resources needed for achieving them
- Assist PDRP Staff in making budget requests and securing approval of grant agreements.
- Initiate recommendations for the enactment, repealing, or extension of emergency ordinances and resolutions for consideration.
- Activate working groups in accordance with needs and circumstances
- Formulate special committees and sub-committees as situations warrant.
- Set a calendar of milestones for redevelopment tasks.
- Recommend the repealing or extension of moratoria.
- Evaluate redevelopment progress using pre-determined criteria and indicators where appropriate; ensure progress is communicated clearly and factually to the public.
- Ensure that the redevelopment process is as transparent and equitable as possible.
- Review and evaluate decisions and actions and, based on lessons learned, recommend amendments to the PDRP, the CEMP, the Comprehensive plan, and other pertinent documents.

Economic Redevelopment Working Group

Post disaster redevelopment is predominantly an economic proposition. Economic recovery and redevelopment is not easily conducted through traditional government action and requires participation from the private sector. The purpose of the Economic Redevelopment Working Group is to gather and organize the expertise and resources necessary to identify and resolve post disaster economic issues and to develop and implement strategies and actions to facilitate and support economic recovery and redevelopment.

Primary Areas of Focus

- Business survival, resumption and retention
- Small business assistance
- Addressing changes in market and workforce composition/workforce recovery
- Tourism renewal
- Innovative strategies for economic redevelopment
- Long-term impacts caused/exacerbated by climate change and sea level rise
- Tax incentives/policies to spur business reinvestment
- Increase capital availability to businesses
- Improved assessments of damage to local/regional economies
- Communication/coordination among local, state, federal governments on economic redevelopment matters

Representative Assistance & Advisory Members & Resources

- Palm Beach County Economic Development Office
- Small Business Development Centers
- Palm Beach County Small Business Assistance Office
- Tourist Development
- Palm Beach County Private-Public Partnership
- South Florida Business Resiliency Consortium
- The Center for Enterprise Opportunity
- Palm Beach County Black Business Investment Corporation (BBIC)
- BAC Funding Corporation
- Palm Beach County Sports Commission, Inc.
- Palm Beach County Cultural Council
- Business Loan Fund of the Palm Beaches, Inc.
- Film & Television Commission, Inc.
- Port of Palm Beach
- Palm Beach County International Airport
- Urban League of Palm Beach County, Inc.
- Community Redevelopment Agency
- Palm Beach County Health Department
- Chamber of Commerce of the Palm Beaches
- Palm Beach County Health Department
- Farm Credit of South Florida, ACA
- Workforce Alliance of Palm Beach County, Inc.
- Palm Beach County Resource Center, Inc.
- Business Development Board of Palm Beach County, Inc.
- Economic Council for Palm Beach County
- World Trade Center Palm Beach
- Representative large, medium-sized, small businesses
- Center for Technology Enterprise & Development, Inc.
- Palm Beach County Horse Industry Council
- Palm Beach County Cooperative Extension
- Land Development Services
- Enterprise Development Corporation
- Palm Beach County Metropolitan Planning Organization
- Palm Beach International Airport
- Port of Palm Beach
- South Florida Regional Transportation Authority
- Economic Development Research Institute
- Governor's Office of Tourism, Trade and Economic Development (OTTED)
- Florida ESF #18
- Enterprise Florida
- FEMA Private Sector Division
- Small Business Administration
- Department of Commerce
- Economic Development Administration
- U.S. Department of Labor
- Business Civic Leadership Center/U.S. Chamber of Commerce

Infrastructure & Public Facilities Restoration Working Group

The Infrastructure & Public Facilities Restoration Working Group is the lead implementing body for coordinating with appropriate local and regional organizations and agencies to plan for the timely repair, reconstruction, and enhanced resilience of Palm Beach County's critical public and private infrastructure and public facilities following a major disaster.

Primary Areas of Focus

- Security of critical infrastructure information
- Infrastructure services to priority redevelopment areas and other areas of new service resulting from redevelopment
- Infrastructure services to interim redevelopment needs
- Infrastructure and public facility repair
- Communication and coordination among agencies, jurisdictions, and stakeholders
- Long-term impacts caused or exacerbated by climate change and sea level rise

Representative Assistance & Advisory Members & Resources

- Palm Beach County Engineering & Public Works
- Palm Beach County Road & Bridge Division
- Palm Beach County Facilities Development & Operations Department
- Municipal Facilities Managers
- Florida Public Utilities Company
- Palm Beach County Water Utilities
- Municipal Public Utilities Departments
- South Florida Water Management District
- Lake Worth Drainage District
- Florida Power & Light
- Palm Beach County Metropolitan Planning Organization
- Property Appraiser's Office
- Teco Peoples Gas System
- City Gas
- Palm Beach County School District
- Comcast
- Verizon Wireless
- AT&T
- Palm Beach International Airport
- Port of Palm Beach
- Florida DOT
- U.S. Department of Transportation
- SEC/FEC/Amtrak Railroads

Land Use Working Group

The Land Use Working Group is responsible for working in coordination with relevant local and regional organizations and agencies to ensure redevelopment is done consistent with the visions of the County and cities and in a manner that will increase the resiliency of Palm Beach County to future disasters. It will seek reasonable solutions to highly political and contentious issues relevant to post disaster land use.

Primary Areas of Focus

- Prioritizing areas to focus rebuilding, reconstruction, and redevelopment
- Build-back standards
- Develop policies for redeveloping land areas that have sustained repeated damages from disaster events
- Long-term impacts caused or exacerbated by climate change and sea level rise

Representative Assistance & Advisory Members & Resources

- Palm Beach County Planning, Zoning, and Building Department
- Municipal planning, land development and growth management departments
- Treasure Coast Regional Planning Council
- Palm Beach County Land Use Advisory Board
- Palm Beach County Housing & Community Development Department
- Palm Beach County Metropolitan Planning Organization (MPO)
- Planning Commission
- Local Emergency Planning Committee
- Rural Lands stewardship Council
- South Florida Ecosystem Restoration Task Force
- Florida Public Service Commission
- Florida Department of Community Affairs
- Florida Fish & Wildlife Conservation Commission
- The Office of Community Revitalization (OCR) - Countywide Community Revitalization Team
- Community Redevelopment Areas
- Cooperative Extension Service
- Palm Beach County Environmental Resources Management Department
- South Florida Water Management District
- Drainage Districts
- Sugar Cane Growers Cooperative of Florida
- Property Appraisers Office
- PBC Parks & Recreation
- Palm Beach County Water Utilities Department
- Community/ Neighborhood Planning Program
- Countywide Community Revitalization Team (CCRT)
- Palm Beach County Economic Development Office
- Florida Power & Light
- U.S. Department of Housing & Urban Development

Environmental Restoration Working Group

The Environmental Preservation & Restoration Working Group coordinates with relevant local and regional organizations and agencies to restore natural resources after a disaster, prevent environmental degradation during redevelopment, and address concerns over contamination from debris and damaged industrial sites.

Primary Areas of Focus

- Hazardous materials, debris contaminants
- Environmental review of temporary sites
- Waterway debris removal, pollution
- Wetland restoration
- Habitat restoration on conservation lands
- Urban forest restoration
- Environmental review of housing sites/neighborhoods
- Long-term impacts caused or exacerbated by climate change and sea level rise

Representative Assistance & Advisory Members & Resources

- Palm Beach County Environmental Resources Management Department
- USACOE - Jacksonville District
- South Florida Water Management District (SFWMD)
- Florida Department of Environmental Protection
- Environmental Protection Agency Region 4
- Environmental Protection Agency - Office of Wetlands, Oceans, and Watersheds
- Palm Beach County Water Utilities Department
- Palm Beach County Road & Bridge Division
- Palm Beach County Division of Emergency Management
- Palm Beach County Health Department - Environmental Health & Engineering
- Palm Beach County Parks & Recreation Department
- Palm Beach County Planning, Zoning & Building Department
- Palm Beach County Solid Waste Management Department
- Municipal Public Works Departments
- United States Fish and Wildlife Service
- Florida Division of Forestry
- Environmental & Ecotourism Groups
- Nature Preserves, Centers, Gardens
- Universities & Colleges
- Professional Societies (NPDES, South Florida Ecosystem Restoration Task Force, etc.)
- Oil Spill Taskforce

Health and Social Services Working Group

The Health and Human Services Working Group is large diverse group responsible for working in coordination with relevant local and regional organizations and agencies to ensure that Palm Beach County will be able to meet the increased health, social service, and public safety needs of its population after a major disaster and make a smooth transition from short-term recovery services to long-term redevelopment assistance. Special attention will be given to the socially and economically vulnerable most severely affected during a disaster event. The Health and Social Services Working Group identified and prioritized the following list of issues.

Primary Areas of Focus:

Health and Medical

- Hospital, clinic, medical office restoration
- Medical personnel retention and recruitment
- Mental health assistance
- Assisted living and nursing home safety
- Long-term assistance for special needs population
- Health related pollution and environmental justice
- Community redevelopment from Healthy Communities perspective

Safety and Security

- Public safety service levels reestablished throughout county

Education

- Schools, higher education reopened
- Daycare, after-school and youth programs restored
- Recreation, cultural activities restored

Health and Social Services

- Public transportation restoration
- Children and family services
- Low income assistance
- Homeless programs
- Coordination and assistance for NGOs and volunteers

Representative Assistance & Advisory Members & Resources

▪ Palm Beach County Human Services Division ▪ Disaster Recovery Coalition ▪ Palm Beach County Health Department ▪ National Volunteer Organizations Active in Disaster (NVOAD) ▪ FEMA ESF 14 Long-Term Community Recovery ▪ Small Business Administration ▪ United Way ▪ Salvation Army ▪ American Red Cross ▪ United Way	▪ Project Hope ▪ Unmet Needs Committee ▪ U.S. Army Corps of Engineers ▪ Palm Beach County Division of Emergency Management ▪ Area Agency on Aging ▪ Children's Services Council of Palm Beach County ▪ Citizens Advisory Committee on Health & Human Services ▪ Housing Finance Authority of Palm Beach County

Housing Recovery Working Group

The primary mission of the Housing Recovery Working Group is to support long-range housing solutions that enable Palm Beach County to quickly move its impacted residents out of emergency shelters and into safe, accessible long-term transitional housing while assisting in the repair and replacement of the damaged housing stock in a timely and efficient manner.

Primary Areas of Focus:

- Temporary housing provision and removal
- Rapid repair permitting
- Temporary housing sitting criteria
- Funding assistance and insurance problem
- Non-conforming structures/substantial damage
- Code enforcement and contractor licensing
- Available contractors and skilled construction workers
- Rebuilding enhanced and sustainable homes and neighborhoods

Representative Assistance & Advisory Members & Resources

- Palm Beach County Human Services Division
- Disaster Recovery Coalition
- Palm Beach County Health Department
- National Volunteer Organizations Active in Disaster (NVOAD)
- FEMA ESF 14 Long-Term Community Recovery
- Small Business Administration
- United Way
- Salvation Army
- American Red Cross
- Project Hope
- Unmet Needs Committee
- U.S. Army Corps
- Palm Beach County Division of Emergency Management
- Palm Beach County Department of Housing & Community Development
- Area Agency on Aging
- Urban League of Palm Beach County
- Center for Family Services of Palm Beach County, Inc.
- County – Palm Beach Housing Authority
- Children's Services Council of Palm Beach County
- Citizens Advisory Committee on Health & Human Services
- Housing Finance Authority of Palm Beach County
- Housing & Urban Development (HUD)
- Home Investment Partnership Program
- State Disaster Housing Planning Initiative (SDHPI)
- Disaster Temporary Housing Program - FDEM

Governance and Financial Administration Working Group

The Governance and Financial Administration Working Group is responsible for ensuring the continuity of essential county and municipal government functions and the administration of all disaster-related finances during the long-term recovery process. Financial responsibilities include working with local and regional organizations and agencies to exploit post-disaster funding sources and ensuring public funds are spent wisely, legally and equitably after a disaster.

Areas of Primary Focus

- Provide for continuity of government and operations
- Succession of officers; standby/temporary officers
- Emergency powers and authority
- Project revenue shortfalls
- Coordinate private and public funding
- Pre-develop options for sustainably cutting services or finding other funding sources
- Retain high bond ratings
- Enforce equitable disaster assistance
- Establish internal claims reimbursement process for FEMA funds
- Modify purchasing/contracting procedures to expedite emergency purchases
- Track the following: financial expenditure, including tracking outside resources received and how these funds are being used
- Performance and schedule variance from set goals or estimated timeline (that is determined after level of damage is known)
- Contracting statistics – local businesses, small or minority businesses
- Employment resumption metrics
- Home occupancy and rental rates
- Tourism accommodations' occupancy rates
- Standard of living measurements to judge quality of recovery

Representative Assistance & Advisory Members & Resources

- Palm Beach County Administration - Deputy County Administrator
- Board of County Commissioners - Chair
- Palm Beach County League of Cities - Executive Director
- Municipal Representatives
- Office of Financial Management & Budget (OFMB)
- Legislative Affairs
- Purchasing
- Public Affairs
- Public Safety – Director
- PDRP Executive Committee Representative(s)
- County Attorney's Office
- Florida Department of Community Affairs
- Florida Department of Emergency Management
- Florida Department of Financial Services
- FEMA ESF #14 Long-Term Community Recovery

Public Outreach Working Group

The Public Outreach Working Group will work to maintain open lines of communication among local, state, and federal governments, partnering agencies, and the public so that the entire community has ample access to information regarding the long-term redevelopment process both prior to and following a disaster.

Primary Areas of Focus

- Providing effective and clear communication to all affected groups
- Pre-established outreach methods, traditional and nontraditional
- Establishment or co-location of well-distributed information centers
- Clear and effective cross-communication among governments (local, state, federal)
- Opportunity for public participation in redevelopment decisions
- Public understanding of redevelopment policies before a disaster
- Transparency in redevelopment decisions and activities
- Defense and promotion of area's viability/ability to re-build
- Topics for public outreach should include the following topics suggested by Sarasota County's Plan.

Representative Assistance & Advisory Members & Resources

- Palm Beach County Public Affairs Department
- Media (Local, National)
- Palm Beach County Planning Division (Charrettes)
- Palm Beach County Division of Emergency Management
- Palm Beach County Planning, Zoning & Building Department
- County Attorney's Office
- Working Groups; PDRP Executive Group
- Chambers of Commerce, professional organizations
- Private-Public Partnership (Business Continuity Information Network)
- County and Municipal Public Works
- Workforce Alliance Consumer Affairs
- NDRF/FEMA ESF #14 Long-Term Community Recovery & Mitigation
- Florida House of Representatives
- United Way; Other NGOs, CBOs
- Palm Beach County Health Department
- Disaster Recovery Coalition

Stakeholder Organization and Participation

The Redevelopment Task Force is the official representative advisory body for the PDRP with responsibilities designated by the Board of County Commissioners. There are, however, numerous other organizational representatives and government staff with expertise that could be valuable in both the pre-disaster and post-disaster stages of implementation. To capture willing participants, a stakeholder group has been established that includes the representation of the Task Force but also is open to residents, businesses, or other stakeholders.

PDRP Support Staff

Certain County staff are charged with key PDRP activities. These positions include but are not necessarily limited to:

PDRP Coordinator: A representative of the recovery section of the Division of Emergency Management is charged with coordinating the PDRP plan and program. This includes facilitating and coordinating PDRP plan maintenance, updating and revision and ensuring appropriate integration and coordination of the PDRP with other community planning documents such as the *Comprehensive Plan*, *CEMP*, *Disaster Recovery Plan*, *Local Mitigation Strategy Plan*, *Strategic Economic Development Plan*, etc. The PDRP Coordinator works with County staff to organize meetings and provides technical advice and counsel to the Executive Committee on long-term recovery issues, practices and developments. During non-disaster periods the PDRP Coordinator serves as the primary point of contact on long-term recovery matters for federal, state, and non-governmental organizations and agencies.

Recovery Branch Director: Among other duties, the Recovery Branch Director is charged with working with the Office of Management and Budget, Division of Emergency Management, the Executive Committee, and other County offices on facilitating the securing and coordination of federal, state and other disaster assistance.

Duties consist of, but are not be limited to, the following:

- Determining the types of assistance available and match with needs
- Assisting in the local coordination of federal and state disaster recovery efforts
- Providing local assistance to facilitate federal and state disaster assistance
- Facilitating the securing of federal or state disaster assistance
- Informing decision makers of the types of disaster assistance available.
- Performing other duties as directed by the PDRP Executive Committee or the Board of County Commissioners.

Economic Recovery Coordinator: The Economic Recovery Coordinator will work with the Business & Industry Unit Leader, the Board of the County's Private-Public Partnership, the Business Development Board, and other business-oriented organizations to facilitate the coordination of economic recovery within the business community following a declared disaster.

Duties consist of, but are not be limited to:

- Determining the potential or actual economic impacts and determine short and long term strategies for economic redevelopment
- Assisting in the local coordination of federal and state economic recovery efforts.
- Acting as a facilitator in disseminating accurate economic impact and recovery information to and from the business community and the public.
- Keeping the business community apprised of the types of disaster assistance available.
- Performing other duties as directed by the Economic Redevelopment Working Group, PDRP Executive Committee, or the Board of County Commissioners.

Hazard Mitigation Coordinator: Division of Emergency Management's Hazard Mitigation Coordinator will work with the Local Mitigation Strategy to facilitate, coordinate and otherwise support the long-term hazard mitigation process.

Duties will include, but are not be limited to:

- Promoting the case for capitalizing on post disaster mitigation opportunities
- Identifying potential federal, state and other sources for long-term recovery hazard mitigation assistance
- Communicating assistance opportunities and application guidance to the community
- Facilitating and supporting the development of mitigation plans and projects
- Compiling mitigation project proposals; assisting with the project prioritization
- Assisting eligible applicants apply for and secure mitigation assistance funding,
- Ensuring mitigation projects are conducted in accordance with federal, state and non-governmental program guidelines and consistent with local LMS practices.
- Performing other duties as directed by the Recovery Branch Leader, PDRP Executive Committee, or the Board of County Commissioners

Public Information Officer: As appropriate and circumstance allow, every effort will be made through the working groups and Public Affairs to keep the public fully informed on long-term recovery and redevelopment activities and plans, and to invite public participation in meetings and workshops. Public announcements will be made through web postings and other available means.

PDRP

Linkages with Agencies per the National Disaster Recovery Framework

Guidance Offered by the National Disaster Recovery Framework (NDRF)

At this writing the *National Disaster Recovery Framework (NDRF)* had just been formally adopted (September 2011).

The *National Disaster Recovery Framework (NDRF)* is presented as a conceptual guide to ensure coordination and recovery planning at all levels of government before a

disaster, and defines how federal agencies will work together following a disaster to best meet the needs of states, local and tribal governments and communities and individuals during recoveries. It establishes coordination structures, defines leadership roles and responsibilities, and guides coordination and recovery planning at all levels of government before a disaster happens. It is intended to better utilize resources at the local, state and federal level.

The *NDRF* introduces six new Recovery Support Functions (RSFs) that are led by designated federal coordinating agencies. These RSFs (listed below) roughly align with the County's functional working groups. The RSFs comprise the coordinating structure for key functional areas of assistance. Their purpose is to support local governments by facilitating problem solving, improving access to resources and fostering coordination among state and federal agencies, non-governmental partners and stakeholders. These six RSFs and their designated federal coordinating agencies are:

Recovery Support Function	Federal Coordinating Agency
Community Planning & Capacity Building	FEMA
Economic	U.S. Department of Commerce
Health & Social Services	U.S. Department of Health & Human Services
Housing	U.S. Department of Housing & Urban Development
Infrastructure Systems	U.S. Army Corps of Engineers
Natural & Cultural Resources	U.S. Department of Interior

At this time, it is not clear whether the *NDRF* totally or immediately replaces or augments FEMA's ESF #14 Long-Term Community Recovery function or uses it in an adapted form. Detailed descriptions of the *NDRF*'s organizational and functional elements are contained in Volume 2 of this PDRP.

The *National Disaster Recovery Framework* also establishes three positions that provide focal points for incorporating recovery considerations into the decision making process and for monitoring the need for adjustments in assistance where necessary and feasible throughout the recovery process. Those positions are Federal Disaster Recovery Coordinator (FDRC), State Disaster Recovery Coordinators (SDRCs) and Local Disaster Recovery Managers (LDRMs).

Roles and Responsibilities of Local Disaster Recovery Manager(s)

The *National Disaster Recovery Framework* recommends that local government leaders prepare as part of their disaster recovery plans to appoint Local Disaster Recovery Managers (LDRMs) to lead disaster recovery activities for their respective jurisdictions.

According to the Framework, the role of the Local Disaster Recovery Manager is to organize, coordinate and advance recovery at the local level. The experience and skill sets of these individuals should include a strong grounding in community development and good knowledge of the community's demographics. While these positions will often interact with the emergency management community, it is not necessary that these individuals be emergency management professionals.

The individual(s) occupying the position(s) should be able to represent and speak on behalf of their respective chief executives (e.g., mayors, Administrator, Commissioners, Councils, etc.) and to serve as the jurisdiction's primary point of contact with the State Disaster Recovery Coordinator during the recovery process.

It is suggested that in the event of a multi-jurisdictional disaster impacting Palm Beach County that the Co-Chairs of the PDRP Executive Committee (i.e. Deputy County Administrator and the Executive Director of the League of Cities) are logical candidates to serve in this capacity.

Additional detail on the roles and responsibilities of Local Disaster Recovery Managers is presented in Volume 2.

Roles and Responsibilities of State Disaster Recovery Manager

States lead, manage and drive the overall recovery process and play the central role in coordinating recovery activities that include providing financial and technical support. States oversee regional coordination of recovery, set priorities and direct assistance where it is needed.

States are a conduit to local governments for key federal recovery assistance programs. In addition to managing federally-provided resources, state government may develop programs or secure funding that can help finance and implement recovery projects. An example of this type of assistance is helping communities in issuing bonds after a disaster. Where additional needs exist, states can reassign existing internal resources to streamline and expedite recovery, such as forming a new or ad hoc state recovery agency. States play an important role in keeping the public informed through strategic messaging and working with all other stakeholders to provide an information distribution process.

The *NDRF* looks to State Disaster Recovery Managers to establish and/or lead a statewide structure for managing recovery, provide support for local recovery-dedicated initiatives, ensure local governments understand their responsibilities and options, and facilitate the development of a unified and accessible communication strategy.

Roles and Responsibilities of the Federal Disaster Recovery Coordinator

While disaster-impacted jurisdictions must necessarily and immediately focus on emergency response activities, the decisions made very early after a disaster can greatly influence recovery. In large-scale disasters and catastrophic incidents where a federal role is necessary, the Federal Disaster Recovery Coordinator (FDRC) is a focal point for incorporating recovery and mitigation considerations into the early decision making processes. The Federal Disaster Recovery Coordinator monitors the impacts and results of such decisions and evaluates the need for additional assistance and adjustments where necessary and feasible throughout the recovery. In these situations, the Federal Disaster Recovery Coordinator works as a deputy to the Federal Coordinating Officer (FCO) for all matters concerning disaster recovery. The Federal Disaster Recovery

Coordinator is responsible for facilitating disaster recovery coordination and collaboration between the federal, state and local governments, the private sector and voluntary, faith-based and community organizations. The Federal Disaster Recovery Coordinator partners with and supports the Local Disaster Recovery Manager (LDRM) and the State Disaster Recovery Manager to facilitate disaster recovery in the impacted area.

FDRC responsibilities include developing a strategic approach for coordinating federal assistance and policies. The intent is to facilitate timely, sufficient and effective federal assistance to the impacted State or Tribal government to support its disaster recovery. In addition, the FDRC will work with impacted communities to establish relevant recovery measures. The aim is to track overall recovery progress and support the community in meeting its recovery goals in terms of outcome, milestones and budget; to make timely adjustments to the recovery effort if needed; and to define relationships between new players and the existing framework.

Organizational Relationships

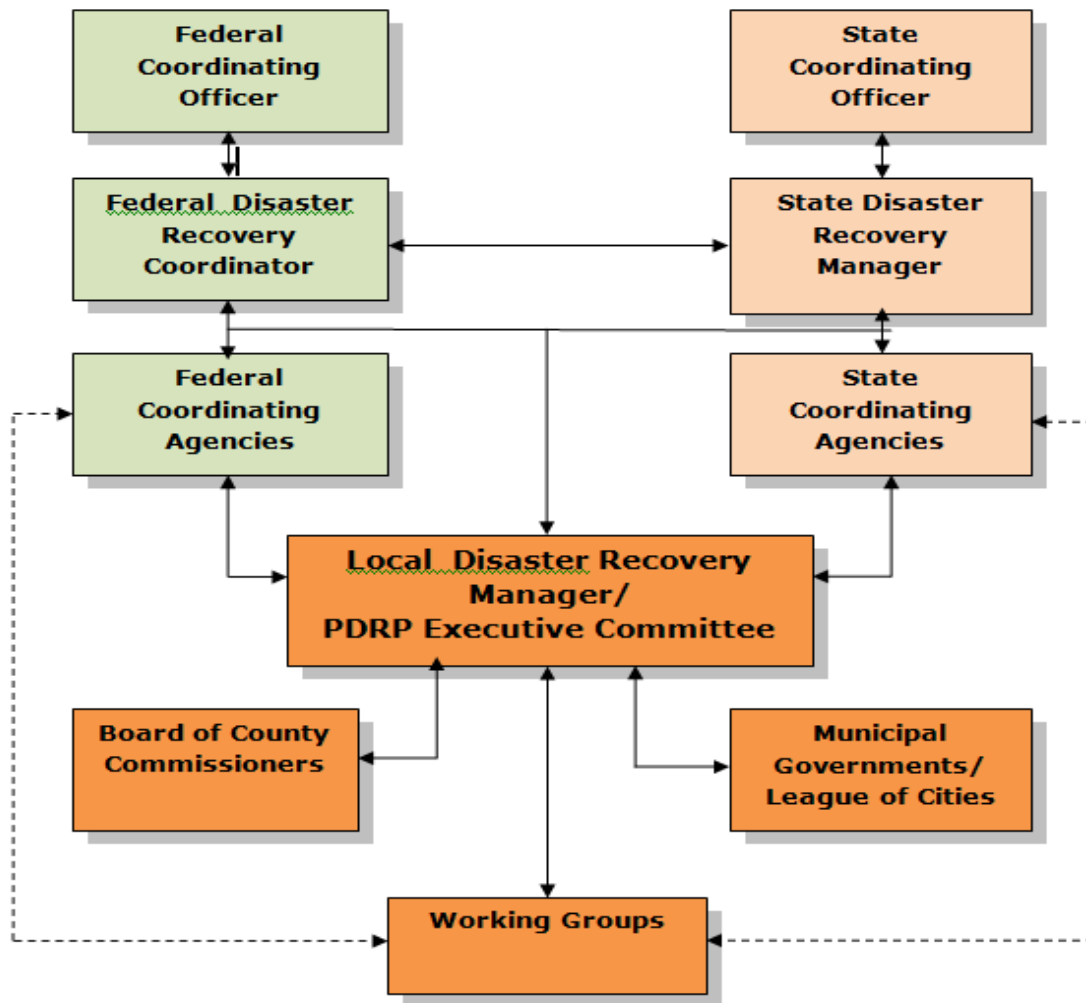
Coordination with regional, state and federal agencies and assistance organizations at the working level will be coordinated primarily through the working groups and the PDRP staff. Higher order decisions and coordination issues will necessitate involvement of the PDRP Executive Committee and County Administration. In all cases a priority will be placed on obtaining maximum assistance benefits while retaining optimal local control over long-term recovery and redevelopment decisions and actions.

Special efforts will be taken during blue sky periods to build a productive working relationship with *National Disaster Recovery Framework (NDRF)* agencies and to become familiar with their roles, responsibilities, practices, expectations and requirements. This will hopefully ensure the best possible collaboration and coordination following disaster events.

The County also will continue to develop and sustain regional private and public sector partnerships that will, whenever possible, allow for mutual aid and resource sharing. All efforts will be made to recognize the primacy of local and regional resources in rebuilding communities and the economy.

The following figure depicts how the PDRP organization will link with the NDRF organization operationally.

Organizational Linkage of PDRP with State and Federal Agencies in Accordance with The National Disaster Recovery Framework



Role of the Recovery Operations Center (ROC)

Implementation of post disaster long-term recovery and redevelopment will require frequent and, at times, sustained on-going interactions within and among the working groups, integration of public and private sector subject matter expertise, and the ability to work closely and collaboratively with state and federal organizations. The Recovery Operations Center (ROC) concept is intended to help satisfy these needs.

The ROC will be a temporary, special purpose facility, independent and physically separate from the County's Emergency Operations Center (EOC). The Emergency Operations Center facility and staff must be freed to focus on its primary mission of Emergency Management and to maintain its preparedness to deal with future disasters and emergencies.

Long-term recovery involves different players with different skill sets, different outside resource organizations and programs, different issues and agendas, and different time horizons. Many of those involved in long-term recovery and redevelopment must juggle these activities with the need to return to normal non-disaster related job functions. The ROC provides the ability to keep these functions separate and organized, with fewer competing priorities and distractions.

Later sections of the PDRP provide additional detail on the location, use, and operations of the Recovery Operations Center during long term community recovery and redevelopment as well as the physical and logistical requirements for supporting it. Selection of an appropriate, available facility or facilities will be done by Facilities Development and Operations in cooperation with the PDRP Executive Committee, the State Disaster Recovery Manager and the Federal Disaster Recovery Coordinator.

Pre Disaster PDRP Implementation

While the primary emphasis of this PDRP is to guide post disaster actions and decisions, the PDRP suggests a number of key initiatives to be carried out before disaster events threaten or occur. Implementation of these pre-disaster initiatives is important to building a more disaster resilient community.

The following Section lists a number of suggested priority pre-disaster initiatives which should be implemented as soon as time and resources permit. This will require Working Groups to remain current and active on an ongoing basis.

Some of these pre-event initiatives might be productively pursued in conjunction with the County's Local Mitigation Strategy, CRS and other ongoing community improvement programs.

ACTION PLAN

To assist in implementation of the PDRP this section briefly lists actions for post-disaster recovery and redevelopment in a matrix format. The actions listed in this section are not exhaustive of everything that should or could be done leading up to or following a disaster event. It is inevitable that as Palm Beach County gains new experience with disaster recovery and as we deal with the uniqueness of a disaster event, additional recovery and redevelopment actions will surface. Some of the actions in this section are one-time occurrences, meaning once the task has been accomplished it can be dropped from the "to do" list. The matrix format of this section, which is kept in a separate electronic spreadsheet file, should assist in easily updating the actions of the

PDRP. Completed actions that do not need to be implemented every time there is a disaster event can be removed from these tables and kept as a record of accomplishments. New actions can be added and the list can easily be resorted by one of the fields to meet the needs of any user of the Plan. More information on maintenance of the PDRP can be found in Volume 3.

The Action Plan is divided into short-term and long-term recovery/redevelopment and into pre-disaster and post disaster actions. Post disaster short-term actions are addressed by the Recovery Plan. This results in three PDRP action matrices (Pre-Disaster Short-Term Actions; Pre-Disaster Long-Term Actions; and Post Disaster Long-Term Recovery Actions) that are each sorted by the Working Group responsible for implementation.

Each table or matrix contains an action identification column. Actions are assigned an identification code based on the major topic area that it is related to (found in Volume 3) and then a unique number assigned in no particular order. Each action in the tables is assigned to an issue topic and to a Working Group that is responsible for its implementation (see Section 3, Implementation, for further information on working group responsibilities). Whether the action is meant for only the unincorporated county or if it has a countywide potential, is also noted in the tables. As municipalities adopt the plan, they may wish to have their jurisdiction listed on particular actions to record their intent to implement those actions. Even actions listed as countywide may not be applicable for all jurisdictions to implement. It is up to each adopting jurisdiction to decide which actions they find appropriate for their community and to add their own unique actions to the plan. The action tables also include a Municipal Participation Form on which the municipality can submit which actions they plan to address. The action tables also include the approximate timeframe for implementation and funding considerations, which may allude to possible funding sources listed in Volume 3. In addition, the post disaster action tables include a Disaster Level column that includes one or more of the disaster scenario levels (minor, major, or catastrophic).

Short-term Recovery Actions

The short-term recovery stage of the PDRP includes actions which should be started before long-term redevelopment occurs. These are short-term actions which have long-term impacts and implications. Some issues, such as debris management, may have a response component contained in the CEMP in addition to the actions listed in this PDRP. Typically the timeframe in which to complete these short-term actions will be shorter than the timeframe for long-term actions.

The tables also present the short-term recovery actions that should be done in the “blue-skies” or pre-disaster period. They contain the short-term recovery actions that will be needed after a minor, major, or catastrophic disaster event occurs in Palm Beach County.

Pre Disaster Short-Term Actions

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Administration	LG-10	Debris Management and Disposal	Create municipal debris management plans: To maximize coordination and effective, rapid clean-up, municipalities should create their own plans OR the municipalities and county should expand the existing debris management plan to be inclusive of all jurisdictions and multiple agencies.	NA	XX Municipalities	Immediate.	In-house staff from Engineering and SWA coordinates with municipalities.
Administration	LG-11	Debris Management and Disposal	Secure Pre-event contracts from non-local waste collectors: The County already holds pre-approved contracts (PBC Debris Management Plan, 2005). Those should be assessed to determine that contractors have resources beyond the likely storm impact area, which would allow them to operate immediately. Local contracts could be supplemented with back-up contracts for non-local company in case locals are not operational.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Administration	LG-12	Debris Management and Disposal	Determine pre-existing conditions at all Debris Collection sites: FL Dept. of Environmental Protection (FDEP) advises soil and groundwater testing be undertaken to establish pre-existing conditions to which the site must be restored prior to official closure.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Building & Housing	LG-13	Debris Management and Disposal	Annual Reassessment of Debris Collection sites: GIS analysis will show the availability of parcels and any changes in adjacent land use which may have occurred since the site was selected. Follow-up with ground truthing.	NA	Unincorp. County and XX Municipalities	Conduct Annually.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Building & Housing	LG-14	Debris Management and Disposal	Identify Potential Debris Sites in Municipalities: Potential debris sites within municipalities are not included in the current PBC Debris management plan. In preparation for a catastrophic event, municipalities may wish to identify potential sites within their jurisdictions that can be used for debris. These debris sites could be operated by the municipality, or by the SWA pursuant to interlocal agreement, and would speed the clean up and recovery process.	NA	XX Municipalities	Immediate. Conduct annual reassessment.	In-house staffing.
Building & Housing	LG-16	Debris Management and Disposal	Promote Recycling of Surplus Materials from Reconstruction Activities: Salvaging construction materials from hurricane debris is not practical on a large scale. After a disaster, however, rushed, fragmented repair and rebuilding often results in extra construction materials being tossed in with construction debris while they could be easily salvaged. A substantial private-sector infrastructure exists within the County to recycle this type of waste and a process should be identified pre-disaster to make recycling as easy as tossing for contractors. When reconstruction activities begin, these recycling facilities should be advertised and the use of them highly encouraged.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Building & Housing	LG-17	Debris Management and Disposal	Create Public Education campaign for the proper segregation of debris: Set the categories and explain the need to separate types of debris.	NA	Countywide	Immediate.	In-house staffing.
Public/Private Infrastructure & Facilities	LG-20	Critical Infrastructure & Facility Repair	Maintain current infrastructure designs and electronic back-up files: Staff should <i>continue</i> to analyze the structural integrity of the infrastructure systems (e.g., roads, culverts, bridges) to determine weaknesses and develop improved designs to increase mitigation. New construction designs could be kept on file, with electronic back-ups, for the at-risk system components. By maintaining electronic copies of designs, staff can act faster post-disaster and integrate mitigation into the repair process.	NA	Unincorp. County & XX Municipalities	Begin as soon as possible.	In-house staffing and/or hire consulting firm.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Public/Private Infrastructure & Facilities	LG-21	Critical Infrastructure & Facility Repair	Budget outlays for new designs and reconstruction: Considering the high cost and necessary function infrastructure systems provide, special budget outlays should be established as a contingency fund for post-disaster reconstruction or pre-disaster implementation of new, more advanced designs.	NA	Unincorp. County & XX Municipalities	Adjust every FY to ensure adequate funding.	In-house staffing + a source of funds for the budget outlays.
Public/Private Infrastructure & Facilities	LG-15	Critical Infrastructure & Facility Repair	Prearranged contracts with non-locals for repairs or supplies: Local companies should be used for public facility repairs if they have the capacity to do so after a disaster. However, to make sure that these repairs are made as soon as possible after a disaster, pre-arranged contracts with non-local companies should be made as a back-up.	NA	Unincorp. County & XX Municipalities	Begin as soon as possible.	In-house staffing.
Public/Private Infrastructure & Facilities	EP-27	Shortage of Contractors/Supplies Slows Repairing of Homes and Businesses	Stockpile temporary repair and/or construction materials needed for immediate repairs to public facilities: A small warehouse and stockpile of materials needed for cleanup and quick repairs to public facilities such as schools and government offices should be obtained so that a delay in supplies does not hinder resumption of public services. If excess supplies are available after public repairs have been made these can be opened for sale for private use.	All	Unincorp. County and XX Municipalities	Procure prior to next hurricane season and restock annually as needed.	Disaster Recovery Fund.
Public/Private Infrastructure & Facilities	EP-17	Rapid Restoration of Power & Private Utilities	Improve interconnections between utility providers: Isolated failures in utility infrastructure can place extreme burden on certain citizens. Improved interconnections will alleviate those isolated failures by providing service from adjacent systems. Improvements can include larger capacity lines that can provide full service quickly and valves controlled remotely that will function from afar without personnel.	NA	Countywide	Begin as soon as possible.	Seek state assistance through programs such as HMGP.
Public/Private Infrastructure & Facilities	EP-18	Rapid Restoration of Power & Private Utilities	Include multiple utility representatives on the Infrastructure Working Group: With FPL, Adelphia, multiple municipal water utilities, and PBC water and wastewater services, this issue is a complex network of players that must be coordinated to achieve a swift and efficient restoration of power and other utility services.	NA	Countywide	Immediate.	No cost.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Housing Recovery	LG-1	Availability of Temporary Housing/ Long-term sheltering	Vacant Lands Inventory: Locate suitable parcels for the placement of temporary housing units (tents or trailers). Inter-departmental coordination needed to ensure vacant sites have adequate access to infrastructure and will be compatible with adjacent land uses. Utilize selection criteria in Temporary Housing Plan for Catastrophic Events (see Appendix D).	NA	Countywide	Conducted annually, prior to storm season.	In-house staffing.
Housing Recovery	LG-2	Availability of Temporary Housing/ Long-term sheltering	Housing Stock Analysis: Identify those areas of County with most vulnerable housing stock - likely due to age, poor maintenance, or sitting - and assure temporary housing lots are nearest these areas. Also, could require greatest amount of redevelopment attention.	NA	Countywide	Immediate.	In-house staffing and/or consultant.
Housing Recovery	LG-3	Availability of Temporary Housing/ Long-term sheltering	Inform Damage Assessment Teams (DAT) of Temporary Housing and Long-term Shelter Sites: Inform DATs of temporary housing sites with a GIS layer of these sites included on their laptops. Habitability assessments needed in initial phase to determine if previously selected sites can be used.	NA	Unincorp. County and XX Municipalities	Conducted annually, immediately prior to storm season.	In-house staffing.
Housing Recovery	LG-4	Availability of Temporary Housing/ Long-term sheltering	Pre-arranged agreements with hotels to house government employees and aid workers: Secure agreements with nearby hotels to house government employees and the influx of external aid workers deemed essential for sustaining government functions.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Housing Recovery	LG-5	Availability of Temporary Housing/ Long-term sheltering	Assistance in finding rental units for temporary housing: The Temporary Housing Plan suggests using vacant apartments and condo units to house displaced citizens (Temporary Housing Plan for Catastrophic Events, 2005). Due to the rapid turnover of rental units and the nature of private property, relying on vacant units will be a logistical problem, which could result in fewer available units than anticipated prior to the event. While utilizing available rental housing should be encouraged, finding these units will be up to individuals. The County could assist by setting up a website that allows land lords/rental agencies with undamaged available units to submit this information. Community Redevelopment Centers could have computers and telephones available for displaced persons to search for housing through this website. Staff could be available to assist.	NA	Countywide	Immediate.	In-house staffing and/or consultant to set up website.
Housing Recovery	LG-6	Availability of Temporary Housing/ Long-term sheltering	Create an On-site Employee Housing Permit: Allow business owners to apply for a special permit to allow on-site employee housing in the event of a disaster. Staff will establish short term code compliance and ensure infrastructure hook ups are present in order to place housing on-site at major employment centers, utilizing parking lots, vacant industrial lands, or campus office centers.	NA	Unincorp. County and XX Municipalities	Prior to next hurricane season.	In-house staffing.
Housing Recovery	LG-7	Availability of Temporary Housing/ Long-term sheltering	Designate Long Term Shelters: The county could designate secondary shelter sites in order to vacate the emergency, school-based shelters for repairs and swift restoration of educational services. Focus on community centers, church facilities, etc.	NA	Countywide	Immediate.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	LG-22	Fair & Equitable Distribution of Disaster Assistance	Procedures for securing donations and services from the private sector: In the aftermath of a disaster, there may not only be individual donations to groups such as the Red Cross, but private sector groups may wish to donate money or services for particular recovery functions. A procedure for accepting and properly using these donations should be in place. Also, some donations of services could be pre-arranged with the private sector in the event of a disaster.	NA	Countywide	On-going.	In-house staffing.
Economic Redevelopment	LG-23	Fair & Equitable Distribution of Disaster Assistance	Prioritize Low Income Census Tracts for Recovery Resources: Utilize U.S. Treasury Department Investment Area Criteria to designate census tracts that should have first access to recovery grants and other financial assistance.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	LG-40	Sustaining Essential Governmental Services	Create countywide clearinghouse for PDRP-related documentation: To ensure access, especially after a disaster, to needed documents by all working to implement PDRP actions, create a countywide clearinghouse of all materials relevant to implementation of the PDRP, as well as backup procedures. These materials include, but are not limited to, plans cited herein, all mutual aid agreements for post disaster assistance, and approved, pre-arranged contracts for post-disaster work. Documents should be available in hardcopy at the EOC library and in electronic format preferably accessible through a secure website.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	LG-26	Sustaining Essential Governmental Services	Model Damage for Different Storm Scenarios: Using local GIS data, HAZUS and Solid Waste Authority modeling capabilities, produce countywide estimated damage scenarios based on the level of disaster. These can be used in both planning and training for post-disaster redevelopment.	NA	Countywide	Prior to next hurricane season.	In-house staffing and/or consultant.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	LG-27	Sustaining Essential Governmental Services	Perform Mock-Disaster Finance Exercise: Using realistic damage estimates for a Category 4 or 5 hurricanes, conduct an exercise that includes finance staff and decision makers in determining how to proceed with essential services with inevitable depletion of revenues.	NA	Unincorp. County and XX Municipalities	Prior to next hurricane season.	In-house staffing, possibly hire consultant to conduct.
Economic Redevelopment	LG-28	Sustaining Essential Governmental Services	Prioritize Essential Services: Creating a prioritized list of those services that citizens need immediately (i.e., law enforcement, public works, and housing) can help speed the decision making process for post-disaster funding and reconstruction.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Economic Redevelopment	LG-29	Sustaining Essential Governmental Services	Maintain Mutual Aid Agreements statewide: The agreements can help sustain services when many local staff and employees may find themselves victims of the disaster event. Establishing agreements statewide prepares the county for large disasters which will also adversely affect neighboring jurisdictions such as Broward and Martin Counties.	NA	Unincorp. County and XX Municipalities	On-going.	In-house staffing.
Economic Redevelopment	LG-30	Sustaining Essential Governmental Services	Maintain a list of possible funding sources for disaster recovery and redevelopment: Funding sources are included in this plan (Appendix D), however, new ones may arise and some may disappear. Current changes being made to FEMA and pilot programs being tested in Mississippi and Louisiana right now are examples of changes that could come to post-disaster funding opportunities. Annual updating of the funding list is essential.	NA	Countywide	On-going.	In-house staffing.
Economic Redevelopment	LG-31	Sustaining Essential Governmental Services	Establish protocols for County operational assistance to municipal jurisdictions: In the event that municipalities are overwhelmed and require operational assistance, agreements with the County should clearly state the parameters of authority and control for particular services provided.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	LG-32	Avoiding Erosion of Local Control	Establish a Disaster Recovery Fund: By creating recovery funding mechanisms (e.g., savings funds, stand-by line of credit) available for post-disaster recovery and redevelopment actions, local jurisdictions can exercise greater control over decision making and have the ability to set programs and actions in motion without having to wait for State or Federal assistance.	NA	Unincorp. County & XX Municipalities	Account for general contingency fund in annual FY. And, work with banking community for credit line.	Portion of budget set aside as savings.
Economic Redevelopment	LG-34	Municipal Insolvency following a disaster	Establish procedures for municipalities receiving financial assistance from the County: In the event that municipalities are overwhelmed by disaster and lose the financial foundation to remain stable in the short term, assistance agreements with the County should clearly state services provided, proper authority and control, and procedures for restoring stability to the municipality.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Economic Redevelopment	LG-35	Municipal Insolvency following a disaster	Assist municipalities in developing Continuity of Operations Plans (COOPs) and coordinate with county COOPs: Not all municipalities currently have COOPs which could assist in planning for a situation which could lead to insolvency. Having coordination between the many municipalities' COOPs and the many county departments' COOPs could help establish procedures for dealing with possible municipality problems in providing services.	NA	Unincorp. County and XX Municipalities	As soon as possible.	In-house staffing and consulting services needed.
Economic Redevelopment	LG-36	Municipal Insolvency following a disaster	Information Sharing between Municipalities and County: When entering into assistance agreements, providing access to information regarding administration practices, contracts, and GIS files can facilitate a more efficient response on the part of the county staff. A GIS Countywide Clearinghouse could be created that provides back-up of this critical data and access by all involved in disaster recovery.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	LG-37	Use of Local Business Capabilities in Disaster Recovery	Create a Public-Private Partnership Network to supplement government recovery/redevelopment activities: Certain services cannot be fulfilled by the government post-disaster. Establishing a partnership framework that utilizes the capabilities of private businesses to fill the particular voids can be beneficial to citizens.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	LG-38	Use of Local Business Capabilities in Disaster Recovery	Include local businesses in pre-arranged contracts for recovery and redevelopment: While it would not be wise to rely entirely on local capabilities in a post-disaster situation, contract bids could be scored higher that have plans to sub-contract with local businesses if they are operational. The local governments could also arrange for services from local companies but have back-up agreements with outside companies (e.g., unaffected areas of FL, out-of-state) in the event that the locals are unable to operate.	NA	Unincorp. County and XX Municipalities	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	EP-2	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Locate possible sites for post-disaster temporary office space: On an annual basis prior to hurricane season, locate buildings/spaces that could be at least partially used for temporary space for businesses in need after a disaster, e.g., hotel meeting space or portions of community centers. Set up pre-arranged agreements for use of the spaces. Also, locate properties near business districts that mobile units could be placed on for temporary office space.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	EP-22	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Make arrangements to secure mobile units/trailers for temporary office space: To provide more temporary office space than can be secured in undamaged buildings, mobile units should also be provided. Pre-arranged agreements to deliver these mobile units after a disaster should be made. The Small Business Administration (SBA) should be approached to see if they would create a program to provide these just as FEMA provides temporary housing trailers.	NA	Countywide	Prior to next hurricane season.	Grants/assistance from SBA or work to get a sponsoring company to help with costs; Disaster Recovery Fund.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	EP-23	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Establish criteria for placing small businesses in temporary office sites: To ensure those businesses most in need of operating space are placed in the limited amount of temporary sites, scoring criteria and an application need to be created for use after the disaster. Example criteria: damage to office space prevents any safe use, financial need, ability of business to be productive during recovery period (i.e. no/limited loss of customer base due to disaster).	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	EP-3	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Locate possible sites for Business Recovery Centers: Using GIS, determine areas of high office concentration and search for facilities that could be used temporarily after a disaster for Business Recovery Centers (i.e., Workforce Alliance or chamber buildings). Secure pre-disaster agreements for a facility in each area and an alternate in case of damage or access problems.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	EP-4	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Secure supplies for temporary offices and business recovery centers: Work with office supply and electronics companies to secure agreements for donations such as desks, chairs, computers, etc. to supply temporary office spaces and business recovery centers in the event of a disaster. Create a list and estimated amount of supplies that may be needed.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Economic Redevelopment	EP-5	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Coordinate with Workforce Alliance to co-locate services with Business Recovery Centers: Assisting employers in the search for employees can facilitate recovery. Co-locating the two entities can assist both parties. Coordinate with Workforce Alliance, which has offices in each region of the county.	NA	Countywide	Establish partnership prior to event, and keep operational with the Business Recovery Centers.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Health & Human Services	EP-24	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Encourage local physicians to create a coalition/network focusing on post-disaster recovery or enter into mutual aid agreements: Doctor offices are an important part of the small business community. Due to specialized equipment and office needs, offering temporary office space is not a very practical option. Instead forming a network or coalition may be helpful so that they can assist each other through sharing offices and equipment until repairs can be made. In addition, for doctors and nurses who cannot work out of their facilities, a network could assist in temporarily placing them with clinics and other doctor offices that need extra staff to deal with increased needs after a disaster.	NA	Countywide	Prior to next hurricane season.	In-house staffing.
Governance & Financial Admin.	EP-15	Shortage of Contractors/ Supplies Slows Repairing of Homes and Businesses	Encourage Contractors and Citizens to maintain pre-arranged agreements for hurricane repairs: Finding a contractor after even a small storm is not easy and often results in damage going unrepaired for months or more. By making arrangements with qualified contractors before a storm for them to repair any damage, it allows for quicker repairs and for the contractor to already be aware of what supplies they may need so they can pre-stock to some degree.	NA	Countywide	On-going.	Include in next season's public education materials for hurricane preparation and costs will be minimal.
Public/Private Infrastructure & Facilities	EP-26	Shortage of Contractors/ Supplies Slows Repairing of Homes and Businesses	Provide staging areas for contractors and repair crews: Work crews of various trades consume open parking lots as their staging areas, preventing the entities using those sites from returning to normal operations. Defining regional locations that can be used as staging areas will coordinate recovery and redevelopment logistics.	NA	Countywide	Locate sites prior to hurricane season. Review annually.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Public Outreach	EP-28	Agricultural Losses or Lake Okeechobee Dike breach	Continue utilization of community-based structure (e.g., CERTs) in the Glades area to facilitate hazard recovery/redevelopment and information dissemination: Given the current concerns over immigration, government officials may not be welcome in many areas of the County. The CERT structure should be established to address CEMP-related issues. (e.g., ESOL teachers could work within the community to identify individuals that could take a leadership role.) This structure should also be used to spread recovery and redevelopment information to the immigrant population.	NA	Unincorp. County and XX Municipalities	Prior to hurricane system.	In-house staffing. Volunteers within the schools.
Public Outreach	SE-1	Reducing Incidence of Fraudulent & Unethical Practices	Create Public Education campaign to inform citizens of services offered by the county: Many incidents of fraud and deception occur when individuals are not aware of proper procedures or legal protections. The county could educate its citizens thoroughly about the services that will be provided and proper procedures to follow in an attempt to prevent such fraudulent acts.	NA	Countywide	Prior to next hurricane season.	In-house staffing; include in next season's hurricane education materials.
Public Outreach	SE-2	Reducing Incidence of Fraudulent & Unethical Practices	Provide Personal Finance Consultation Services at Community Redevelopment Centers: Secure pre-arranged agreements with firms to provide expert volunteers to counsel individuals and small business owners on their financial options after the disaster. Lack of knowledge or assistance often forces people into selling their property in a rush for much less than it's worth or falling prey to predatory lenders.	NA	Countywide	Immediate.	None if firms donate staff time.
Public Outreach	SE-24	Reducing Incidence of Fraudulent & Unethical Practices	Educate the public on risks of using unlicensed contractors: Hurricane preparation education prior to storms should include information on why unlicensed contractors should not be used and how to check the credentials of a contractor. This information can also be made available at the Community Redevelopment Centers after a hurricane.	NA	Countywide	Immediate.	In-house staffing; include in next season's hurricane education materials.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Governance & Financial Admin.	SE-5	Reducing Incidence of Fraudulent & Unethical Practices	Establish a countywide liaison with the State Attorney General fraud task force: This individual will act as Palm Beach County's liaison with the State Attorney General and Department of Consumer Affairs. Work should focus on pre-disaster education campaigns and informing the public of scams regarding home repairs, charity/donations, price gouging, ID theft, and insurance payments, among others. Also, the liaison could work with the media to keep citizens informed of recent fraudulent trends.	All	Countywide	Immediately seek to create the group. Can go into investigative action soon after recovery begins.	In-house staffing and possibly temporary employees.
Public Outreach	SE-3	Individual's Role in Preparing for & Recovering from a Disaster	Create an education campaign for increased self reliance after a disaster: Encourage residents and businesses to start disaster savings (future possibility of Congress making tax-free disaster savings accounts) for their insurance deductibles, temporary housing needs, and other costs. Also stress need to acquire property or rental insurance that covers appropriate hurricane damages. These longer-term preparedness issues can be included with education on family evacuation plans, longer food and water supplies, and keeping personal medical/prescription records.	NA	Countywide	Immediate.	Partner with media outlets and financial service firms.
Health & Human Services	SE-25	Adequate Health and Mental Health Services Available During Recovery	Assess capabilities of hospital system and medical transport services to cope with non-operational hospitals: Due to the vulnerable location of some hospitals in Palm Beach County there is the possibility of in a major disaster certain hospitals may not be operational not just during immediate response but for a longer-term. The ability of the other hospitals to deal with increased demand in this case should be assessed including their financial capabilities to deal with increased uninsured patients. Also the need for mutual aid agreements to borrow helicopters or other transport services to deal with increased distances to operational emergency rooms should be assessed. A mock-disaster training session including detailed risk assessments for the hospital system could be a useful tool.	NA	Countywide	Begin assessment prior to next hurricane season.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Public/Private Infrastructure & Facilities	SE-16	Water Pollution from Sewer System Failures	Create Surface water cleanup procedures: Surface waters, including streams, canals, rivers, lakes, and the ocean, can all be contaminated by sewer system failures. Contingency plans for quick clean up should be in place to prevent or slow widespread contamination. It is a two-part clean up, including solids and bacterial particles.	NA	Unincorp. County and XX Municipalities	As soon as possible.	Staff time in coordination with the SFWMD and USACE.
Land Use	SE-17	Increased Fuel for Wildfires on Conservation Lands	Identify properties with potential for wildfire risk if there is a hurricane: Using conservation lands and Property Appraiser GIS shape files create a list of property owners and contact information within 1,000 ft. of wooded, conservation tracts. The list will be used to raise awareness about increased risk of wildfire due to hurricane debris during the recovery period after a hurricane.	NA	Countywide	List should be prepared annually prior to hurricane season.	Minimal staff time will be required to use GIS to prepare the list.
Health & Social Services	SE-22	Unhealthy Levels of Mold in Damaged Structures	Educate the public of the health risks of mold: Include educational information in hurricane preparation materials and through the media about identifying mold problems, avoiding structures with large concentrations of mold, and hiring mold remediate's. Special-needs individuals who are more susceptible (i.e. home oxygen users) should receive high priority in education efforts. Creative methods for reaching these groups should be developed (such as vendors of oxygen equipment).	NA	Countywide	As soon as possible.	In-house staffing; can be added to existing hurricane education materials.
Land Use	RM-8	Ensuring Strong Code Enforcement	Revise "Post-Disaster Temporary Permit Suspension" (Building Moratorium) ordinance (Article XII, Sec. 7): Create a rolling moratorium, based on DAT reports, that utilizes the existing triaged damage assessment approach. Those areas which experience the most severe damage will have the suspension lifted later. This allows less affected areas to begin the rebuilding process. Also, place activation/deactivation authority in the hands of the Building Division Director, who will better recognize the personnel workload and backlog.	NA	Unincorp. County	Immediate. One-time Action.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Health & Social Services	RM-25	Communicating with & Involving the public in Recovery and Redev. Issues	Encourage faith and community organizations to collect evacuation contact information: These groups could ask their members to provide email addresses and phone numbers (i.e., cell numbers or out of state family) they could be reached through in the event of long-term evacuation. The groups could then assist in getting messages about repopulation and rebuilding out during the recovery period.	NA	Countywide	Immediate.	In-house staffing.
Land Use	RM-17	Including Mitigation in Rebuilding	Partner with home improvement stores and major home builders to advocate structural hazard mitigation: By spreading information about mitigation techniques in the places where homeowners are turning to start repairs they could be persuaded to include mitigation while they are making repairs. Stores and contractors can be armed ahead of time with educational materials to offer customers during redevelopment after a disaster.	NA	Countywide	Immediate.	In-house staffing and educational materials. Solicit partner companies to pay the cost of printing.

* See Section 3 for a list of Working Group Chairpersons or Appendix D for a suggested list of Working Group contributing members

** See Appendix D for funding source information.

LG= Local Government Recovery Issues (Section 2.1), EP= Economic and Private Sector Issues (Section 2.2), SE= Social and Environmental Issues (Section 2.3), RM= Redevelopment and Mitigation Issues (Section 2.4)

Pre Disaster Long-Term Actions

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Land Use	LG-18	Debris Management and Disposal	Establish housing demolition protocols: Protocols for demolition of destroyed homes for absent property owners should be established so that these unsafe, blighted structures do not remain for too long. Lobbying efforts should focus on making the process of financial reimbursement from FEMA for demolition easier for local governments. Also, the demolition process should include detailed documentation, i.e. photos, of the structures prior to demolition for insurance purposes of the owners if they are not able to return prior to demolition. Once procedures are developed, send information out with property tax statements to inform owners of the demolition protocols and the timeframe involved for them to return or contact the local government about the destroyed structure after a disaster. The property owners should be solicited to provide voluntary contact information such as cell phone number or email address where they could be reached after a disaster in the case of their structure being on the demolition list. This could be added to the current property appraiser database.	NA	Countywide	Immediate.	In-house staffing.
Economic Redevelopment	EP-1	Ability of Small Business to Stay Afloat until Adequate Financial Assistance is Available	Assist small business with continuity planning and mutual aid agreements: Through the Private-Public Network and other business organizations as well as at the time of applying for an occupational license, make available templates and other information about how to create a business continuity plan for small businesses. Also, introduce the idea in the business community of mutual aid agreements between businesses. Provide continuity training sessions and presentations at chamber meetings or as special workshops in addition to website and print materials.	NA	Countywide	Immediate.	In-house staffing. Grants for temporary positions to educate business community.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Government/Housing	SE-4	Reducing Incidence of Fraudulent & Unethical Practices	Preventing Predatory Real Estate investment and 'house flipping': Investigate creative options to decrease the financial burden on low-income homeowners attempting to reestablish themselves in the county. Could take the form of reducing or waiving property taxes, or working with local banks and lending institutions to deter, reduce, or waive mortgages for a certain amount of time after a disaster impacts the county.	NA	Countywide	Immediate.	In-house staffing and coordination with local lending/banking institutions.
Health & Social Services	SE-26	Adequate Health and Mental Health Services Available During Recovery	Lobby the State to establish an online database of medical records and recent prescriptions: A dispersed population, new medical personnel, and fragmented filing are encumbrances to efficient post-disaster medical care. An integrated electronic database of records, prescriptions, allergies, etc. will allow physicians to access records from afar or for patients with whom they have no prior experience. Louisiana and other states have done this after the problems they encountered with Katrina. There are many privacy issues that would need to be addressed, however.	NA	Countywide	Coordinate with AMA and local medical community and suggest prior to next hurricane season.	In-house staffing.
Health & Social Services	SE-27	Adequate Health and Mental Health Services Available During Recovery	Encourage Employee Assistance Programs to address post-disaster mental health: Employers (including local governments) can provide free and confidential counseling through an employee assistance program to assist with post-disaster stress. Also employees can be educated to be sensitive of signs of possible post-disaster stress in their co-workers.	NA	Countywide	Immediate.	In-house staffing and outreach through private-public partnership and other business organizations.
Environment Restoration	SE-9	Coastal and Aquatic Restoration	Ensure FDEP files/permits are up to date: FDEP must have approved beach/dune design templates on file to expedite post-disaster nourishment project approval. Inspections are also necessary for upland sand sources.	NA	Countywide	Annual.	In-house staffing.
Environment Restoration	SE-10	Coastal and Aquatic Restoration	Revise beach/dune templates as necessary: FDEP approves the design templates for approx. 5 years, but this period can be shortened when severe erosion is experienced.	NA	Countywide	3-5 year cycles depending on erosion rates.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Environment Restoration	E-18	Increased Fuel for Wildfires on Conservation Lands	Promote Management Plans for Conservation Areas with emphasis on dealing with hurricane debris: Amend County Parks management plans to include strategies for dealing with increased wildfire fuel from hurricane debris. Require through comprehensive plan policy that conservation easements include language for fuel maintenance, particularly after a hurricane. Coordinate with state-owned conservation areas to ensure management plans address hurricane debris.	NA	Unincorp. County and XX Municipalities	Adoption or amendment of management plans and inclusion of comp plan policies should occur ASAP. This is not a recurring action.	In-house staffing.
Land Use	RM-1	Ability to Rebuild Stronger Structures	Amend Homeowner & Neighborhood Association covenants: Restrictive covenants often preclude the introduction of valuable hazard mitigation measures. The covenants can be amended to improve disaster resiliency. This can be done voluntarily through public education or, in newly proposed areas, require all new covenants to address mitigation.	NA	Unincorp. County and XX Municipalities	Immediate. Begin education and attempts to amend.	In-house staffing; education outreach costs.
Land Use	RM-2	Ability to Rebuild Stronger Structures	Bring Structures into Compliance with current building codes: Structures that exceed the 50% threshold for substantial damage shall be required to come into compliance with the current regulations of the Florida building code. Lowering the threshold for substantial damage to 45% or 40% could increase future resiliency and improve insurance rate premiums.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Land Use/PDRP Staff	RM-3	Ability to Rebuild Stronger Structures	Increase skilled construction workforce: In order to meet the demand for reconstruction, coordinate with local community college or vocational schools to offer construction and trades classes. Include accreditation courses on the FL Building Code, which could be conducted by the Building Code Education & Outreach Council.	Major & Catastrophic	Unincorp. County and XX Municipalities	Create framework for quick post-disaster implementation.	Seek state assistance.
Land Use	RM-4	Ability to Rebuild Stronger Structures	Increase Wind Load Velocity regulations: Pursue legislation to introduce more stringent wind load velocity (156 mph) regulations for Palm Beach County in the Florida Building Code.	NA	Countywide	Immediate.	In-house staffing, lobbying costs.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Land Use	RM-5	Ability to Rebuild Stronger Structures	Expand V-Zone regulations to A-Zones: Stringent flood prevention regulations directed toward V-Zones should be expanded to structures found in A-Zones. Structures could come into compliance voluntarily or once hazard related damages exceed the 50% threshold. A-Zones often experience similar flood, surge, and wind hazards but do not currently meet most protective development standards.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing.
Land Use/Public Outreach	RM-6	Ability to Rebuild Stronger Structures	Public education to promote hardening and mitigation: Conduct workshops or public education campaigns to encourage citizens to build structures that exceed the Florida Building Code and include hardening and mitigation advances.	NA	Unincorp. County and XX Municipalities	Immediate.	Add to LMS for funding opportunities.
Land Use	RM-11	Limiting Redevelopment in Hazardous Areas	Create non-conforming structure inventory: Non-conforming structures -- those built prior to adoption of Comp. Plan/ULDC regulations of area, height, lot coverage, yard setbacks, lot location, parking, or other dimensional requirements -- are not allowed to be rebuilt to the previous standards upon reaching the 50% damage threshold. Maintaining an inventory will speed the decision making process for redevelopment orders and permitting.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing or consultant costs.
Public/Private Infrastructure & Facilities/ Governmental Operations	RM-12	Limiting Redevelopment in Hazardous Areas	Petition FDCA for expedited Comprehensive Plan amendment review/approval: In order to redevelop quickly and in a smarter fashion, the Comprehensive Plan may require amendments. The county could lobby FDCA to establish a temporary county office during redevelopment to attend planning meetings and charettes and rapidly process amendments.	NA	Unincorp. County and XX Municipalities	Immediate.	None.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Land Use	RM-13	Limiting Redevelopment in Hazardous Areas	Renew funding for Conservation Land Acquisition Selection Committee (CLASC) purchases: The CLASC could play a role in post-disaster land acquisition if properly funded. Also, selection criteria should be expanded to include mitigation against natural hazards. Acquisition could allow the County to assemble parcels for inclusion in the open space program and it will enable the County to avoid the same amount of destruction in future storm events.	NA	Unincorp. County and XX Municipalities	Immediate.	In-house staffing, bond referendum or other funding source.
Land Use	RM-20	Including Affordable Housing in Redevelopment Projects	'No Net Loss' Resolution adopted: Jurisdictions can pass a resolution to show support for all citizens to return after a major or catastrophic disaster and the intent to provide housing for a mixture of income levels. Any measure more stringent may encounter property rights issues.	NA	Unincorp. County and XX Municipalities	Immediate. One-time action.	None.
Housing Recovery	RM-21	Including Affordable Housing in Redevelopment Projects	Address Post Disaster Redevelopment in the County Workforce Housing Program regulations: Include provisions in the County workforce housing program addressing redevelopment. The program could require workforce housing be included in those apartment/condo buildings and/or developments which experience damages in excess of 50% of the total value. Also, all new post-disaster construction must be in compliance with the existing workforce housing program.	NA	Unincorp. County	Immediate.	None.

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Post Disaster Long-Term Recovery Actions

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Housing Recovery	LG-9	Availability of Temporary Housing/ Long-term sheltering	Subsidize long-term temporary housing: Staff could identify and disburse emergency rental housing assistance funds through the Community Redevelopment Centers for citizens awaiting the restoration of permanent residences. (Predicted as a preferred FEMA approach in future.)	Major & Catastrophic	Unincorp. County and XX Municipalities	Disbursal will begin with cessation of gov't provided sheltering. End point dependent on funds.	Financial assistance: FEMA, State, Disaster Recovery Fund Processing; In-house staffing.
Economic Redevelopment	EP-9	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Create Business Improvement Districts (BID) in downtown and retail centers: BIDs can provide a way for businesses to pool resources to encourage people to return to these areas to shop, eat, etc. With cuts to local government resources, repairing the appearance of these areas to attract customers may be a low priority.	All	Countywide	Soon after the disaster.	In-house staffing to assist in creating BIDs.
Public Outreach	EP-10	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Advertise the quick recovery and resumption of business to the nation: Once it is safe for people to return and businesses reopen, especially retail/restaurants, make sure the nation is aware of the recovery to avoid stagnation of the local economy and invite returning seasonal residents. If a major disaster strikes, the news coverage of the devastation will remain in many peoples' minds and slow investment in the area unless counteracted with positive images of recovery.	Major & Catastrophic	Countywide	Depending on the level of disaster but after enough time has elapsed for businesses to have reopened.	In-house staffing to produce press releases and work with reporters. Possibly produce and run commercials with State assistance.
Economic Redevelopment	EP-11	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Produce statistics for post-disaster economic environment for better marketing business opportunities and discovering needs: The demographics and economic environment is likely to have dramatic changes after a disaster. For businesses to access the market and the workforce capabilities they will need new population and economic statistics. The County can assist by having a post-disaster report done and distributing to the business community.	Major & Catastrophic	Countywide	Depending on the level of disaster but after enough time has elapsed for some of the population to have returned.	Would most likely be done through a consultant. Grants or state money may be available but may not want to wait for these.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Economic Redevelopment	EP-12	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Hold an Economic Development Charette for the business community after a disaster: Due to unforeseen changes from a disaster, the current economic development plans may need updating to reflect changed conditions. To do this, a charette could be held to solicit creative solutions to rebuilding the economy - industry, tourism, medical, retail, and research and development.	Major & Catastrophic	Countywide	Depending on the level of disaster but after enough time has elapsed for some of the population to have returned.	In-house staffing and facilitation services.
Economic Redevelopment	EP-13	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Beautification/landscaping for tourism: Landscaping and other physical attributes which add to a sense of place and attract tourist and seasonal residents, needs to be replaced. While not an immediate need, these little touches should not be forgotten if the County also is working on repopulation.	All	Countywide	Within a year after the disaster.	Local volunteer groups and grants such as Urban Forestry Grant.
Economic Redevelopment	EP-14	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Adjusting Incentive Packages: Businesses that received incentive packages as a means to lure economic development to the county could be granted a waiver on measurable objectives they must achieve before collecting the full package. Previously decided upon criteria could become a disincentive for the business to remain and redevelop. The waiver could provide more time to achieve the objectives or reduce the objective while maintaining the same timeframe.	Major & Catastrophic	Countywide	Analyze need for such a program within a few months after the disaster.	In-house staffing.
Economic Redevelopment	EP-25	Avoiding Permanent Relocations of Core Businesses Outside of the Community	Develop special post-disaster incentive packages to entice business to remain in Palm Beach County: The County can utilize current programs or develop new programs to provide incentive packages to businesses to redevelop and restore operations, rather than relocate to unaffected areas.	Major & Catastrophic	Countywide	Analyze need for such a program within a few months after the disaster.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Public/Private Infrastructure & Facilities	EP-19	Rapid Restoration of Power & Private Utilities	Build in Mitigation during reconstruction of utilities: Underground utilities have a high up-front cost but will ultimately lower expenditures and assist in a more rapid restoration of power after disasters. Other mitigation efforts can focus on hardened, stronger designs for the infrastructure, such as stormwater, water, and wastewater facilities and systems.	All	Countywide	Implement after DAT findings are analyzed.	Private utilities assume costs but could be assisted or loaned funds through the Disaster Recovery Fund.
Health & Social Services	SE-7	Restoring Educational, Cultural, and Historic Amenities	Assisting Educational and Cultural Facilities find funding for repairs and restoration: After the disaster, local governments should designate staff to assist in finding grants and other assistance for these facilities.	All	Unincorp. County and XX Municipalities	After immediate response activities have been completed.	In-house staffing.
Health & Social Services	SE-8	Restoring Educational, Cultural, and Historic Amenities	Tax breaks for Historic Structure Restoration: Providing property tax breaks for proper restoration of historic structures damaged by the disaster.	All	Unincorp. County and XX Municipalities	Prior to property taxes coming due.	Will be a slight decrease in revenues.
Environment Restoration	SE-11	Coastal and Aquatic Restoration	Coordinate with FDEP & USACE to conduct erosion assessment: This is the first step in securing approval and funding to undertake nourishment projects.	All	Countywide	Immediately following the storm event.	In-house staffing.
Land Use	SE-12	Coastal and Aquatic Restoration	Reassess CCCL: In a catastrophic, 100-year storm event, the erosion will be so great to warrant reassessing and possibly moving the demarcation landward.	Catastrophic	Countywide	Begin following the FDEP erosion assessment.	In-house staffing and surveying costs.
Environment Recovery	SE-14	Coastal and Aquatic Restoration	Assess and restore damaged coral reefs: Using volunteers from local scuba dive organizations survey possible damage to local coral reefs. Where severe damage has been found secure grants to restore reefs as these are a major tourism draw and are already highly threatened.	All	Countywide	After immediate response activities have been completed.	Volunteers for initial survey and contract for restoration work. Grants through national organizations may be available.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Environment Restoration	SE-15	Coastal and Aquatic Restoration	Marine debris cleanup: Hurricane debris finds its way into the intracoastal waterway, ocean, and connected waterbodies. Clearing large or toxic debris is necessary for public safety as well as environmental protection. Coordination with the Coast Guard, USACE, and Lagoon Keepers is recommended.	All	Countywide	After immediate response activities have been completed.	Grants are available through NOAA and other organizations.
Land Use	RM-7	Ability to Rebuild Stronger Structures	Conduct Building Code effectiveness analysis: County should <i>continue</i> to conduct analysis of the adopted building code in search of areas that can be improved as a means to increase public safety.	Major & Catastrophic	Unincorp. County and XX Municipalities	After deactivation of plan.	In-house staffing or partner with local universities to conduct research.
Land Use	RM-10	Communicating with & Involving the public in Recovery and Redev. Issues	Utilize Visioning Process for severely impacted areas: The Visioning Process found in Appendix D should be utilized to avoid piecemeal redevelopment and include citizen participation.	Major & Catastrophic	Unincorp. County and XX Municipalities	After completion of damage and habitability assessments.	In-house staffing. Funding needed for advertising and facilitation/planning services.
Land Use	RM-14	Limiting Redevelopment in Hazardous Areas	Establish Revitalization, Redevelopment, & Infill Overlays (RRIO) in areas that experienced severe wind damage: This mechanism for redevelopment already exists within the Comprehensive Plan. Establishing RRIOs in those areas damaged significantly by a storm event (but not due to surge or flood) could encourage redevelopment and designate them as preferred receiving area for the county's TDR program. Incentives or grants for redevelopment could be prioritized for these areas.	Major & Catastrophic	Countywide	Immediately following analysis of DAT findings.	In-house staffing.
Land Use	RM-15	Limiting Redevelopment in Hazardous Areas	Down-zoning undeveloped parcels in hazard-prone areas: Where parcels have not been permitted for development and remain vacant (or where the parcel's existing use is not as high as the allowable use), post-disaster down-zoning should be explored as a means to reduce vulnerability to hazards. The post-disaster period provides an opportunity for the County to achieve a valid redevelopment and mitigation initiative.	Major & Catastrophic	Countywide	Immediately following analysis of DAT findings. Include as part of community visioning process.	In-house staffing.

Responsible Working Group*	ID	Issue Topic	Action	Disaster Level	Jurisdictions Involved	Approx. Timeframe	Funding Consideration
Land Use	RM-16	Limiting Redevelopment in Hazardous Areas	Initiate municipal cooperation in Transfer of Development Rights program: The county Comprehensive Plan commits to establishing a countywide, multi-jurisdictional TDR program (FLUE, Policy 2.6-p). With the vast majority of coastal properties in municipalities, the County should explore transferring the development rights of damaged coastal properties to the less vulnerable inland locales.	All	Countywide	Immediately following analysis of DAT findings. Include as part of community visioning process.	In-house staffing.
Environment Restoration	RM-19	Including Mitigation in Rebuilding	Institute landscaping & invasive vegetation public education campaign: Non-natives are poorly adapted to the local environment and are more likely to topple or become wind borne, thus causing damage during storm events. Preventing citizens from purchasing and landscaping with them will create a safer, redeveloped community. PBC could team with major lawn and garden centers to reach more citizens (Art. 14 of ULDC).	All	Countywide	Once commercial/retail centers are again operational.	Printing costs for educational materials could be solicited from partner companies. Cooperate with environment. & ag. groups on outreach efforts.
Land Use	RM-23	Including Affordable Housing in Redevelopment Projects	Create Community Land Trusts: County can promote & assist in the formation of CLTs to preserve existing and reconstruct lost affordable housing. The CLTs can be used in post-disaster visioning process as a vehicle for implementation.	Major & Catastrophic	Countywide	During redevelopment visioning process.	Typically funded through grants to start. Disaster Recovery Fund could provide some assistance.
Land Use	RM-24	Disaster Resistant Public Funding Decisions	Public Facility retrofits/repairs built to exceed current standards: When retrofitting/reconstructing public facilities, the County can exceed current FBC standards in order to improve mitigation efforts, secure publicly funded investments, and set an example for citizens.	All	Unincorp. County and XX Municipalities	After completion of damage and habitability assessments.	Increased costs but may lower insurance and future repair costs.

* See Section 3 for a list of Working Group Chairpersons or Appendix D for a suggested list of Working Group contributing members

** See Appendix D for funding source information.

LG= Local Government Recovery Issues (Section 2.1), EP= Economic and Private Sector Issues (Section 2.2), SE= Social and Environmental Issues (Section 2.3), RM= Redevelopment and Mitigation Issues (Section 2.4)

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Post Disaster Redevelopment Plan Volume 2

2012-2013 Edition



A Note About Volume 2 Content Credits

Volume 2 is intended to serve as a primary reference and decision support document for PDRP users. It makes no claim of being a totally original document. It contains a combination of original writings, excerpts from contracted research, and direct excerpts from other credited public access PDRP products, including Hillsborough County's PDRP and the State's Post-Disaster Redevelopment Planning: A Guide for Florida Communities, various federal and state governmental reports, and sea level rise reports prepared by the Southeast Florida Regional Climate Change Compact and Treasure Coast Regional Planning Council



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Quick Reference Guide to PDRP

Volume 1 *PDRP Activation & Implementation*

- What is the Post Disaster Redevelopment Plan?
- Where the PDRP Fits in Disaster Recovery
- Goals for Long Term Recovery
- PDRP Activation
 - Decision Triggers
 - Authority
 - Activation Process
 - Types & Levels of Disasters
 - Key Issue Areas
- PDRP Implementation
 - Organizational Concept & Members
 - Implementation through Working Groups
 - Roles & Responsibilities
 - Linkages with State and Federal Agencies
 - Overview National Disaster Recovery Framework Guidance
- Action Matrices (Pre and Post Disaster)

Volume 2 *Technical / Decision Support Information*

- The Hazard Environment (Natural, Social, Built, Economic, Environmental)
- Hazard Analysis/ Risk Assessments
- Special Section: “Sea Level Rise” Vulnerability Analysis & Adaptation
- Strategies
 - Model
- Detailed Guidance on Key Recovery Issues
 - Governance Challenges during Long-Term Recovery
 - Sustaining Essential Governmental Services in Face of Economic Crisis
 - Infrastructure/Public Facilities Restoration
 - Land Use
 - Housing
 - Economic Redevelopment
 - Health & Social Services
 - Environmental Preservation/Restoration
 - Public Outreach
- Funding & Assistance Sources/Strategies
- Detailed National Disaster Recovery Framework Guidance
- Glossary of Referenced Terms
- Acronyms
- Maps

Volume 3 *Administrative Support Information*

- Plan Development
- Integration with Other Community Plans
- “Sea Level Rise” Plan Integration Model
- PDRP Feedback, Reviews and Critiques
- Plan Maintenance/Updating
- PDRP Rosters/Resources/Contacts
- Appendices

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TABLE OF CONTENTS

INTRODUCTION TO VOLUME 2	8
PALM BEACH COUNTY PROFILE: THE HAZARD ENVIRONMENT	8
Natural Environment	8
Location:.....	8
Geography:	9
The Social Environment	10
Economy:	12
Businesses in Palm Beach County	14
Key Segments of Palm Beach County's Economy	17
The Built Environment.....	21
Residential Units.....	21
Structural Characteristics of County's Single Family Residential Buildings	23
Condos, Town Houses, Co-Ops	25
Age Distribution of Single Family Units	26
Number of Addresses in Special Flood Hazard Areas	29
Coastal High Hazard Areas.....	30
Number of Addresses in the Coastal High Hazard Area	31
Critical Facilities by Jurisdiction.....	33
HAZARD ANALYSIS & RISK ASSESSMENTS.....	35
Primary Hazard Vulnerability Assessments at a Glance	35
Hazard Analysis	40
Hurricanes & Tropical Storms.....	40
Inland Flooding.....	58
Dike Failure.....	81
Sea Level Rise.....	101
Guide to Special Reports and Guidance Documents on Sea Level Rise	119
Overview of Local, Regional, State Activities Related to Sea Level Rise	119
Select Reports: Sea Level Rise in Palm Beach County	122
Integrating Sea Level Rise into Local Plans.....	128
KEY REDEVELOPMENT ISSUES AND PRIORITIES.....	128
The Challenge of Governance during Long-Term Recovery	128
Sustaining Essential Government Services in the Face of Post Disaster Economic Crisis	132
Municipal Insolvency.....	134
MAJOR POST DISASTER REDEVELOPMENT GOALS AND ISSUES	141
Local Government Recovery Issues	141
Economic and Private Sector Issues	148

Social and Environmental Issues.....	152
Redevelopment and Mitigation Issues	157
OBSERVATIONS/GUIDANCE ON KEY RECOVERY ISSUES.....	161
Local Government Recovery Priorities	163
Infrastructure and Public Facilities	168
Rapid Restoration of Power and other Private Utilities (1)	168
Infrastructure for Temporary Recovery Operations (1)	169
Debris Management (1)	171
Financing Infrastructure and Public Facilities Repair (1)	172
Infrastructure and Public Facilities Mitigation (1)	173
Relocation of Vulnerable Infrastructure and Public Facilities (3)	173
Regional Infrastructure Considerations (3)	174
Enhanced Infrastructure Capacity to Priority Redevelopment Areas (3)	174
Land Use	174
Phased Reconstruction and Streamlined Permitting (1)	175
Build Back Standards for Nonconforming and Substantially Damaged Structures (1) ...	176
Controlling Long-Term Post-Disaster Blight (2)	177
Reducing Disaster Vulnerability Through Voluntary Mitigation Programs (2)	177
Prioritizing Areas to Focus Redevelopment (3)	178
Historic Preservation and Restoration (3)	179
Housing.....	180
Availability of Temporary Housing/Long-term Sheltering (1)	181
Temporary Housing Siting Criteria, Provision, and Removal (1)	182
Ability to Reconstruct Homes Rapidly (1)	183
Transitioning Residents Back to Permanent Housing (2)	184
Encouraging Homeowners to Incorporate Mitigation During Rebuilding (3)	185
Economic Redevelopment.....	186
Resumption and Retention of Major Employers (1)	187
Small Business Assistance (1)	188
Workforce Retention (1)	189
Preferential Use of Local/Regional Business Capabilities and Workers in Recovery (1)	190
Tourism Renewal (2)	191
Physical Economic Redevelopment Projects (3)	191
Agricultural Losses from Hurricane Damage or Lake Okeechobee Dike Breach (3)	192
Opportunities to Sustainably Restore Economic Vitality (3)	192
Health and Social Services	193
Social Services to Socioeconomic Vulnerable Populations (1)	195

Re-establish Public Safety Service Levels (1)	196
Coordination and Assistance for Non-Governmental Organizations and Volunteers (1)	196
Provide for Special Needs Populations Throughout Long-Term Redevelopment (1)	197
Public Transportation Restoration and Improvement (1)	197
Reopening of Schools (2)	197
Behavioral Health Assistance (2)	198
Medical Personnel Retention and Recruitment (2)	200
Reducing the Incidence of Fraudulent and Unethical Practices (3)	201
Health-Related Pollution and Environmental Justice (3)	202
Quality of Life Factors (3)	202
Preserving the County's Rich Culture and Heritage (3)	203
Restoring Institutions of Higher Learning (3)	203
Environmental Preservation and Restoration	203
Beach and Dune Restoration (1)	205
Environmental Contamination (1)	205
Environmental and Historic Review of Temporary Sites (1)	206
Natural Land and Habitat Restoration (2)	206
Green Rebuilding (3)	206
Parks and Urban Forest Restoration (3)	207
Water Pollution from Sewer System Failures (3)	207
Preventing/Slowing Salt Water Intrusion into Fresh Water Sources (3)	208
Increased Fuels for Wildfires on Conservation Lands (3)	209
PDRP PRIORITY ISSUES & STRATEGIES BY TOPIC AREA	209
FUNDING & ASSISTANCE SOURCES FOR COMMUNITY REDEVELOPMENT	214
Potential Federal and State Recovery/Redevelopment Funding Sources	216
Recovery Funding Assistance Programs	217
Potential Federal and State Recovery/Redevelopment Funding Sources	225
State and Key Outside Economic Redevelopment Organizations/Agencies	227
Engaging Private Sector Resources in Community Recovery	231
National Disaster Recovery Framework (NDRF)	236
Federal Agencies & Assistance Programs/Services	238
GLOSSARY	240
ACRONYMS	254
RECORD OF REVISIONS	257
APPENDICES	257
Appendix 1: Sea Level Rise Vulnerability & Redevelopment Assessments & Strategies	257
Appendix 2: About the National Disaster Recovery Framework	257

INTRODUCTION TO VOLUME 2

Palm Beach County's PDRP is comprised of three volumes. Volume 2 is intended to serve as a reference, planning, preparation and decision support document. It contains detailed analytical and technical information which expands on information contained in Volume 1. Key sections provide:

- A comprehensive profile of Palm Beach County's hazard environment
- Hazard analysis and risk assessments
- Detailed vulnerability assessments of potentially catastrophic hazards with discussions of mitigation and adaptation strategies
- Special reports on sea level rise including action plans
- Detailed information on the key recovery topics and issues discussed in Volume 1
- Information on federal and state funding and assistance programs and sources
- Descriptive information on the National Disaster Recovery Plan and its implications for Palm Beach County
- Glossaries of referenced terms and acronyms

Working Group members should read and discuss the recovery topics section, particularly the topics which relate to their group's recovery and redevelopment mission.

To simplify navigating the many sections of Volume 2, an interactive Table of Contents has been provided for online users. By clicking on a topic of interest users can directly access it in the document.

PALM BEACH COUNTY PROFILE: THE HAZARD ENVIRONMENT

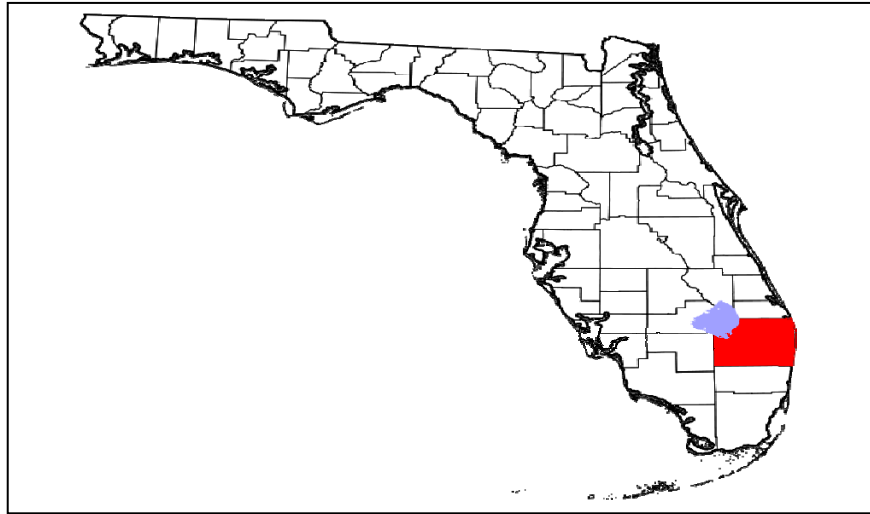
Natural Environment

Palm Beach County's geographic location, coastal beauty, exotic environmental resources and tropical climate have greatly influenced its explosive growth and prominence as a great place to live, work and visit. However, these same natural characteristics also contribute to its vulnerability to a range of natural hazards.

Location:

Palm Beach County is located along the subtropical southeast coast of Florida. The center of the county is approximately 60 miles north of Miami and 150 miles south of Orlando. It borders Martin County on the north, the Atlantic Ocean to the east, Broward County to the south, Hendry County on the west, and Lake Okeechobee on its northwestern boundary.





Geography:

Palm Beach County is the largest county southeast of the Mississippi River (larger than the states of Rhode Island and Delaware). It is comprised of 2,268 square miles of land and 245 square miles of water bodies. The coastal and beach areas of the county extend 45 linear miles from north to south. At its widest point, the county stretches 53 miles from east to west. Its water area includes a portion of Lake Okeechobee, the second largest fresh water lake in the U.S.

The eastern County is a thriving urban area while the western area of the County is more rural with wetlands covering the southwestern part and agriculture dominating the northwestern end. A string of barrier islands parallel the coast separated from the mainland by the Intracoastal Waterway. Four inlets (Jupiter Inlet, Lake Worth Inlet, Boynton Beach Inlet and Boca Raton Inlet) connect the Intracoastal Waterway to the Atlantic Ocean.

Of the 45 miles of ocean shoreline in Palm Beach County, only 3.5 miles are under County jurisdiction. Twenty-three of the thirty-eight municipalities in Palm Beach County border either the Intracoastal Waterway or the Atlantic Ocean. Numerous small unincorporated areas are interspersed between municipalities in the coastal region, with pockets located near the Martin County line, Jupiter Inlet, Jupiter Beach, Juno Beach, Palm Beach Gardens, as well as small pockets near Delray Beach, Boynton Beach and Briny Breezes.

Countywide, development has had a major effect on coastal natural resources as evidenced by beach front development, storm water runoff, destruction of habitats, and dredge and fill projects. Enforcement of existing regulations and the implementation of new regulations as necessary are considered vital to reducing further degradation of coastal resources.

The total length of estuarine shoreline in Palm Beach County is 268 miles, 14 miles (5 percent) is located within unincorporated areas. Sea grass and macro algae coverage of

the total submerged area for Lake Worth Lagoon is 2,110 acres (35 percent of the total area). For the remainder of the estuarine waters there are 270 acres (12 percent of the total area). Generally, the habitat quality of the estuarine ecosystem and beach/dune and near shore ecosystems is best in the County's northern end where development has progressed at a slower pace. Palm Beach County has 462 acres of natural coastal upland acreage in public ownership and 59 acres under private control. Due to the popularity of coastal development, the coastal strand is regarded as the most rapidly disappearing portion of the County.

Palm Beach County possesses a complex network of highly sensitive water features. Lake Okeechobee is the primary water reservoir for South Florida. A system of lakes runs north/south within 8 miles of the east coast. These include: Lake Mangonia (540 acres in size) in West Palm Beach; Clear Lake (401 acres) in West Palm Beach; and Lake Osborne (356 acres) in southern Lake Worth and northern Lantana. Four major canals from Lake Okeechobee to the Atlantic Ocean cut through the county: the Miami Canal, North New River Canal, Hillsboro Canal and West Palm Beach Canal. The West Palm Beach Canal connects Lake Okeechobee and Lake Worth on the east coast. Lake Worth is interconnected with the Intracoastal on its north and south borders. A vast network of canals, all part of the water management system, are interconnected with the West Palm Beach Canal. The County's only river, the Loxahatchee River, runs approximately 8 miles through the northern section of the county, interconnects with the Loxahatchee Slough, and flows through the Jupiter Inlet to the ocean.

Topography:

The Atlantic Ocean touches the eastern half of the county. The northwest part of the county includes Lake Okeechobee. The terrain is sub-tropical, featuring plenty of lush palm trees, tall pines, and a multitude of vivid tropical flowers that bloom year round.

The county is quite flat. The mean elevation is 15 feet above sea level. Ocean coastal beachfront gradually slopes up to a dune line with top elevations of 12 to 23 feet. From the dune line there is a gradual downward slope to lake and inland waterway frontage with a width of from a few hundred feet to a half mile. From there, land slopes upward to a coastal ridge then downward to elevations of 5 to 12 feet in a drainage valley. Farther inland, elevations remain relatively stable. At this writing, the County awaits new LIDAR-based maps from FEMA that should provide accurate elevation information countywide.

The Social Environment

Land Use:

Planners view the county as being comprised of 5 land use tiers. Briefly they can be described as follows:

Urban/Suburban Tier

This tier, the eastern most tier, accommodates the bulk of the population and the need for employment, goods and services, cultural opportunities, and recreation. It supports a variety of lifestyle choices, ranging from urban to residential estate; however, the predominant development form in the unincorporated portion is suburban in character. The older communities are primarily in municipalities within approximately 2 miles of the Atlantic Ocean. Most of the neighborhoods within the tier are stable and support viable communities. However, due to the period in which many of the coastal communities were built and the County's efforts to keep pace with rapid growth in its western areas, some of the eastern areas did not receive a full complement of urban services. Despite aggressive community redevelopment programs, much of the building stock is quite old.

Exurban Tier

The Exurban Tier lies between the Urban and Rural Tiers and supports residential subdivisions created prior to 1970, before the adoption of the Comprehensive Plan and its regulations. Historically, these areas have been considered rural due to a sparse development pattern, large heavily treed lots, presence of small agricultural operations including equestrian uses, and a desire for minimal services and regulation. However, growth has marked a change in the character from rural to more suburban and semi-rural, or exurban, as the existing and vested 1.25 acre lots develop with single family homes. The increase in population has caused an increase in the demand for services. A recognition of the existing development pattern, the demand for services, and a desire to maintain the tier's rural character present planning challenges.

Rural Tier

The Rural Tier, west of the Exurban Tier, includes agricultural land and rural settlements that range in density from 1 dwelling unit per 5 acres to 1 dwelling unit per 20 acres. The area supports large agricultural operations as well as single-family homes with small family-owned agricultural businesses, including equestrian-related uses. Due to the declining availability of land and the increase in population in the Urban and Exurban Tiers, the Rural Tier is beginning to experience pressure for greater densities normally associated with more urban areas. This tier poses the greatest threat in terms of wildland-urban interface fires.

Agricultural Reserve Tier

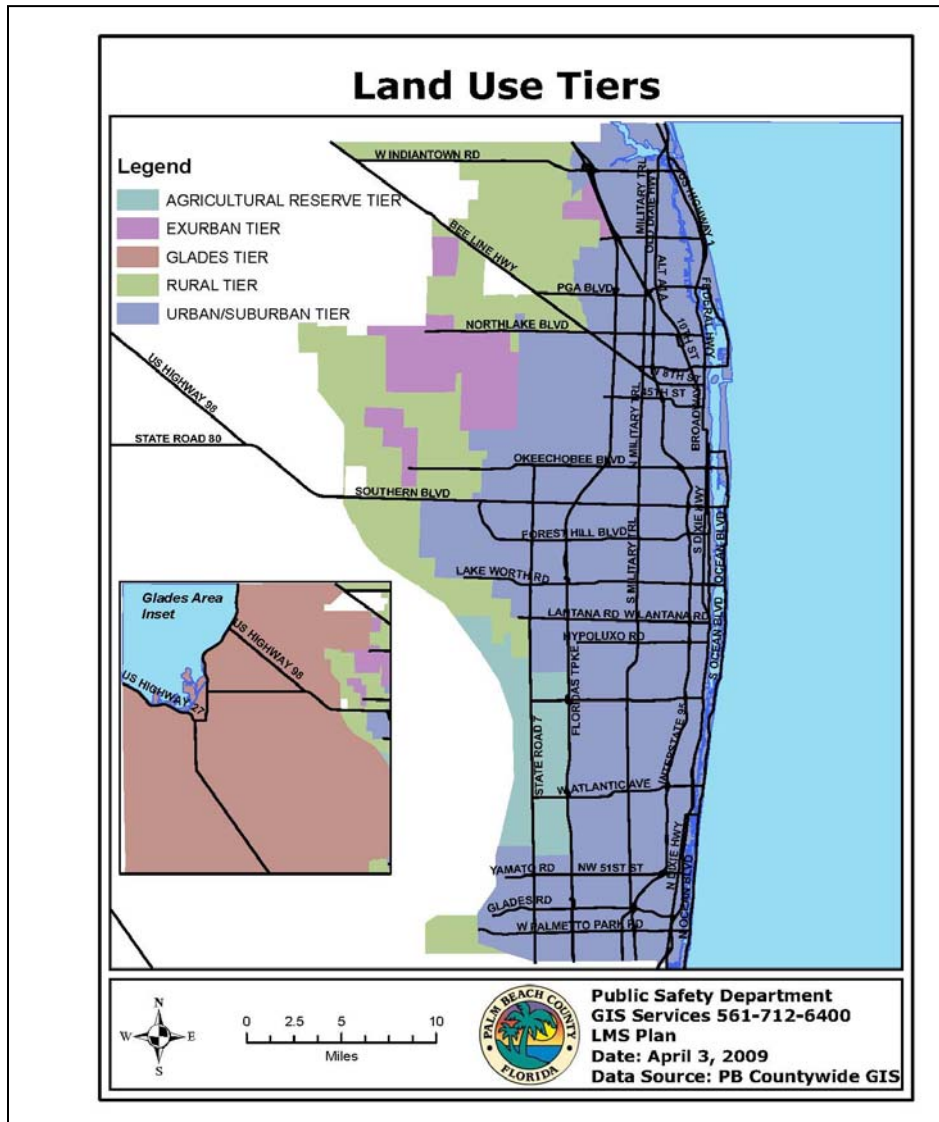
The Agricultural Reserve area is a portion of the County that encompasses unique farmland and wetlands. Based on policy direction adopted by the Board of County Commissioners in 1995, it is envisioned to be preserved primarily for agricultural use. If this becomes infeasible it could be developed at low residential densities.

Glades Tier

The Glades Tier is located west of the Conservation Areas and Twenty Mile Bend and includes the Glades Communities. This area is designated primarily for specialized agricultural operations and recreational uses of Lake Okeechobee. Its proximity to the Lake, its geographical distance from the services of coastal communities, and its lack of

economic resources, pose particular challenges with regard to disaster preparedness and hazard mitigation.

These land use tiers are depicted on the map below.



Economy:

Palm Beach County is an appealing, asset-rich locale that has enjoyed great economic success. In addition to its reputation as a tourist destination, it is also widely recognized as a great place to live and work and continues to be a magnet for retirees.

Palm Beach County is one of the nation's wealthiest counties, with per capita personal income levels nearly 50 percent higher than the state and national averages. It has a vibrant and diverse economic base, sound financial position and moderate debt levels. Four of the County's municipalities (Jupiter Island, Manalapan, Gulf Stream and Palm Beach) rate in the top 25 nationally in terms of income. Overall the County is the third

richest county in Florida in terms of per capita income. Of the 3,100 counties nationwide, Palm Beach is one of only 22 to earn the highest possible bond rating of AAA by all three of the major rating agencies. Palm Beach County is the only Florida county to have earned this designation.

The County has many advantages, including international name recognition, exceptional natural and built resources such as the grand canal system (four major canals that run through the County), rich farm land, extensive waterfronts, and growing science and industrial bases. Three Palm Beach County cities, Boca Raton, West Palm Beach, and Delray Beach, have won national awards for their beautiful downtowns.

The County is the host site for the National Horse Show, hosts the globally recognized Palm Beach International Film Festival, and hosts major Fortune 500 companies such as Lockheed Martin, Pratt & Whitney and the Corporate Headquarters of Office Depot. It is home to the most prominent life science institute in the world, the Scripps Research Institute. On over 250,000 acres in the western communities, Palm Beach County farmers grow the largest quantities of winter crops in the U.S. Its museums, waterfronts and botanical gardens are acclaimed throughout the nation. International Arts and Polo events and a wealth of classic ballet, opera, pop culture and sports events fill the schedules of its communities. The County's subtropical climate attracts tourists and new residents from around the world.

Professional and business services, educational and health services and financial services account for 43% of Palm Beach County's total employment. Between 2005 and 2015 the professional and business services and educational and health sectors are expected to experience the greatest growth.

The table below shows the current and projected county employment breakdown by sector:

Current and Projected Employment by Industry Sector

Industry Sector	Employment 2005 (000's)	% of Total	Employment 2015 (000's)
Professional & Business Services	128.4	18.2	161.2
Educational & Health Services	88.8	12.6	118.8
Financial Activities	85.9	12.1	97.3
Retail Trade	79.0	11.2	84.5
Leisure & Hospitality	71.3	10.1	81.0
Construction	49.2	7.0	58.2
Manufacturing	22.9	3.2	23.2
Wholesale Trade	22.4	3.2	22.6
Transportation & Utilities	15.0	2.1	17.1
Information Services	13.1	1.8	14.4
Agriculture	6.2	.9	5.5
Other	124.5	17.6	142.5
Total Employment;	707.1	100.0	826.3

Source: South Florida Regional Planning Council and Regional Economic Models, Inc.

Businesses in Palm Beach County

There are roughly 49,164 businesses in Palm Beach County that supply products and services. Although the County has a diverse variety of producers, economic development interests have targeted five particular business clusters. These clusters include: Communications & Information Technology; Aerospace & Engineering; Agriculture & Food Processing; Business & Financial Services and Medical & Pharmaceutical products.

Industrial Businesses:

Palm Beach County boasts some of the finest manufacturers in the world. Below is a list of the County's largest industrial businesses in terms of number of employees, product category and location:

Company	Approx. Employees	Product	Location
Florida Crystals	1,900	Agriculture	West Palm
U.S. Sugar Corp.	1,700	Agriculture	Belle Glade
Pratt & Whitney			
Rocketdyne	1,200	Aerospace Engineering	West Palm
A. Duda & Sons Growers	1,100	Agriculture	Belle Glade
Thomas Produce Co.	1,000	Agriculture	Belle Glade
Sikorsky Aircraft	880	Helicopters	West Palm
		Pharmaceuticals, Consumer	
Walgreens Distribution	850	Goods	Jupiter
SimplexGrinnell / Tyco			
Internationa	1698	Security System Manufacturing	Jupiter
IBM Corp.	600	Electronics R&D	Boca Raton
Palm Beach Newspapers	585	Newspaper Publishing	West Palm
Sugar Growers Coop.	552	Agriculture	Belle Glade
Cheney Brothers	550	Food Distribution	Riviera
BIOMET 3i, Inc.	519	Dental Implants	PB Gardens
Tyco Safety / Sensormatic	500	Security System Manufacturing	Boca Raton
ADT Worldwide / Tyco International	470	Machinery Manufacturing	Boca Raton
Belcan Engineering Group	467	Aerospace Engineering	PB Gardens
		Small Home Appliance	
Jarden Consumer Solutions	450	Manufacturing	Boca Raton
Pepsi Cola Bottling Co.	450	Bottled Soft Drinks	Riviera
Siemens / Enterprise Communication	400	Telecommunications	Boca Raton
Meisner Electric, Inc.	400	Electrical Contractor	Delray
Signet Diagnostics Imaging	400	Device Manufacturing	Boca Raton
Lockheed Martin Corporation	400	Aerospace Engineering	Riviera
Cemex / Rinker Materials	300	Concrete Manufacturing	West Palm
Rexall Sundown	300	Pharmaceutical	Boca Raton
Campus Management Corp.	256	Software Design	Boca Raton
Ranger Construction			
Industries	250	Highway Construction	West Palm
Anspach Companies	242	Surgical Equipment	PB Gardens
LRP Publications	215	Multimedia Publishing	PB Gardens
Hardrives, Inc.	200	Highway Construction	Delray
Cross Match Technologies	200	Biometric Identity Systems	PB Gardens
Catalfumo Construction,			
Inc 200		Construction	PB Gardens

Company	Approx. Employees	Product	Location
American Media International	200	Newspapers	Boca Raton
GE Medical Systems Information	200	Medical Equipment	Jupiter
Coca-Cola Bottling	200	Bottled Soft Drinks	West Palm
Kimley-Horn	190	Engineering	West Palm
Biotest	180	Pharmaceuticals	Boca Raton
Hedrick Brothers Construction	165	Construction	West Palm
Gold Coast Distributors	160	Beer Distribution	PB Gardens
Serta Mattress	135	Mattress Manufacturing	Riviera
Farmer & Irwin Corporation	130	Mechanical Construction	Riviera
General Dynamics	129	Aircraft outfitting	West Palm
SV Microwave	125	RF Connectors Manufacturing	West Palm
Thermo Fisher Scientific	105	Professional Equipment & Supplies	West Palm
Neco Foods	105	Manufacture Food Products	Lantana
Power Systems Manufacturing	100	Turbine Parts Manufacturing	Jupiter

Establishments by Industry

Total for all sectors	42,802
Forestry, Fishing, Hunting, and Agriculture Support	88
Mining	15
Utilities	161
Construction	4,1482,
Manufacturing	969
Wholesale Trade	2,428
Retail Trade	5,442
Transportation and Warehousing	772
Information	699
Finance and Insurance	3,144
Real Estate and Rental and Leasing	2,426
Professional, Scientific, and Technical Services	6,950
Management of Companies and Enterprises	215
Administrative and Support and Waste Management and Remediation Services	3,102
Educational Services	498
Health Care and Social Assistance	4,851
Arts, Entertainment, and Recreation	762
Accommodation and Food Services	2,628
Other Services (except Public Administration)	3,595
Unclassified	54

Service Companies:

In the services sector of the economy, a strong cluster of companies is found in Business and Financial services. This cluster represents more than 11,000 companies. Below is a partial list of major service-oriented employers in Palm Beach County, ranked by number of employees.

Palm Beach County Largest Service Organizations ('07)

Organization	Employees		Service Location
School Board	21,707	Education	County Wide
Palm Beach County	11,293	County Government	West Palm
Tenet Healthcare Corp. Delray Community, PB Gardens Med. Good Samaritan, Pinecrest Rehab., West BocaMed. Ctr	4,500	Healthcare	County Wide
HCA (Hospital Corp of America) <i>Palms West, Columbia, JFK Medical Ctr</i>	3,411	Healthcare	County Wide
Florida Power & Light (Hdqtrs)	3,250	Utilities	Juno
Florida Atlantic University	2,923	Higher Education	Boca Raton
The Breakers	2,300	Hotel	Palm Beach
Office Depot (Hdqtrs)	2,180	Office Supplies	Boca Raton
Boca Raton Community Hospital	1,860	Health Care	Boca Raton
Boca Raton Resort & Club	1,650	Hotel Boca	Raton
Bethesda Memorial Hospital	1,600	Health Care	Boynton
City of West Palm Beach	1,544	City Government	West Palm
Veterans Health Administration	1,500	Health Care	West Palm
Jupiter Medical Center	1,400	Health Care	Jupiter
AT&T	1,300	Communications	West Palm
City of Boca Raton	1,297	City Government	Boca Raton
Tropical Shipping	1,000	Containerized Ocean Shipping	Riviera
Wackenhut Corporation	990	Security Services	PB Gardens
Palm Beach Community College	982	Higher Education	Lake Worth
Wachovia	950	Banking	County Wide
NCCI	900	Insurance Actuarial	Boca Raton
South Fl. Water Management Dist.	900	Regional Gov't., Special Purpose	County Wide
National City	880	Consumer Lending	West Palm
City of Boynton Beach	833	City Government	Boynton
Washington Mutual Bank	825	Banking	County Wide
PGA National Resort & Spa	800	Hotel	PB Gardens
Virtual Bank	800	Banking	PB Gardens
Palm Beach Atlantic University	738	Higher Education	West Palm
CSC Applied Technologies LLC	651	Facilities Support Services	West Palm
Prime Management Group Inc	640	Residential Property Managers	Boca Raton
Blue Green Corp.	630	Leisure & Resort Communities	Boca Raton
Bank of America	615	Banking	County Wide
City of Palm Beach Gardens	501	City Government	PB Gardens
Churchill Benefit Corp/Yurcor	500	Computer Systems Design Services	Delray
Verio	450	Wired Telecommunications Carriers	Boca Raton
First NLC Financial Services, LLC	440	Residential Mortgage	Boca Raton
Lynn University	438	Higher Education	Boca Raton
SYSCO Food Services	417	Food Distribution	Riviera
Applied Card Systems	400	Call Center-Credit Cards	Boca Raton
Florida Public Utilities	355	Utilities	West Palm
Oasis Group	325	HR Services	West Palm
Taylor & Francis Group LLC	293	Publisher	Boca Raton
Choicepoint Public Records	280	Computer Programming	Boca Raton
Palm Beach Gardens Marriott	277	Hotel	PB Gardens
Ocwen Financial Corp	258	Real Estate Credit	West Palm
Stain Safe Inc	250	Call Center-Chemical Products	PB Gardens
The Scripps Research Institute	230	Life Sciences Research	Jupiter
DayJet	214	Air Transportation	Boca Raton

AMR-American Medical Response	213	Ambulance Service	Lake Worth
Oxbow Power Corp	200	Life Sciences Research	West Palm
Commerce Bank	200	Banking	West Palm
Lynn Insurance	185	Insurance	Boca Raton

Source: Business Development Board, Harris Infosource (updated 10/2007)

Key Segments of Palm Beach County's Economy

The 2005 Economic Summit identified and discussed several key segments of the county. Some key observations from the summit include the following:

Industries of the Mind

The Industries of the Mind segment represents the existing business clusters in Palm Beach County that address engineering and the flow of ideas and technology – especially bioscience, aerospace, marine science, telecommunications, information technology (IT), and film and television.

Within each of these industries Palm Beach County has either a Fortune 500 Company or corporate headquarters as an anchor. For example, Lockheed Martin Corporation's undersea defense system anchors the marine science industry. The formal collaboration on the bird flu virus between IBM and the Scripps Research Institute is representative of engineering, flow-through technology, and the biotechnology sector. Pratt & Whitney anchors the aerospace industry while the Palm Beach County International Film Festival, ranked as one of the top 25 film festivals in the world, supports the film and television industry.

Finance & Trade

Palm Beach County is a highly regarded location for financial and business investments from around the world as evidenced by the proliferation of exclusive international banking institutions located here. As the global economy continues to evolve, a high quality international investment interest continues to grow and attract international lenders. The County's emergence as a center of international trade, finance, and investment establishes the area as an international prototype for sustainable economic growth.

Key strengths that support the County's establishment as a hub for international trade, finance, and investment are its well known name brand and name recognition. Another strength is the County's beneficial infrastructure – its central location for exporting goods both nationally and internationally. The County's existing integrated transport system of seaport, airports, railways and highways is an asset to this industry's future. Establishment of an Inland Port close to Lake Okeechobee is being aggressively considered. This would further enhance the County's competitiveness for international trade business activities.

Education

Palm Beach County has over 530 educational institutions. Its public school system is the 10th largest in the nation with over 176,000 K-12 students and 94 Career Academy Programs within 163 schools. Over 100 private schools are based in Palm Beach County as well.

Palm Beach County currently has 11 colleges and universities with a combined enrollment of over 75,000 students. These include: Barry University (Enrollment of 9,324); Florida Atlantic University (26,839); Kaplan University; Keiser University (1,360); Lynn University (2,410); Lincoln College of Technology (1,789) University; Palm Beach Atlantic University (3,226); Palm Beach State College (25,122); and South University (771).

Agribusiness, Equestrian & Food Sector

The Agribusiness, Equestrian and Food sector is one of Palm Beach County's historic and consistent economic generators. Both its traditional agriculture and growing equestrian industries benefit from the subtropical climate and a nationally recognized brand identity. Several key strengths that support the Agriculture, Equestrian and Food sector are the county's established infrastructure to support agriculture and equestrian activities. These include being one of the top areas in America for growing winter crops and nursery and ornamental plants, the capacity to house 14,000 horses at peak season, a growing population that provides more customers for local production, the International Horse Show, and high profile equestrian and polo competitions--all of which contribute to the Palm Beach image.

Major issues concerning the Agricultural, Equestrian and Food sector are the rapidly diminishing supply of land available for this use, the need for new processing methods for agricultural products, increasingly strict water regulations, fierce global competition in agricultural products, and the lack of a comprehensive plan for growing the equestrian industry.

Quality of Place Attractions

Quality of Place is the term used by the County to describe a location where people experience an inviting and stimulating environment that engages them on physical, emotional and spiritual levels and makes people feel safe, accepted, and comfortable and find enjoyment. Key factors that shape Palm Beach County's quality of place are its natural assets, arts and culture and the built environment. Palm Beach County enjoys numerous natural resources and conservation lands, parks and beaches. The County boasts world-class museums, performing arts centers, notable historical sites and a mix of multicultural festivals.

Recreation & Sports

With 45 miles of stunning coastline, Palm Beach County is an outdoor-lover's paradise. Visitors and residents can go fishing, diving and boating on the County's many waterways or relax on its pristine beaches. As home to the Professional Golfers Association of America, Palm Beach County has long been known as a golfer's paradise, with more than 150 challenging courses.

A number of parks and recreational facilities offer everything from picnic areas and bicycle paths to ball fields and tennis courts. Other popular outdoor attractions include the Palm Beach Zoo at Dreher Park and Lion Country Safari.

The Roger Dean Stadium complex in Jupiter is a popular destination for baseball fans. It is the spring training site for the Florida Marlins and St. Louis Cardinals and the minor

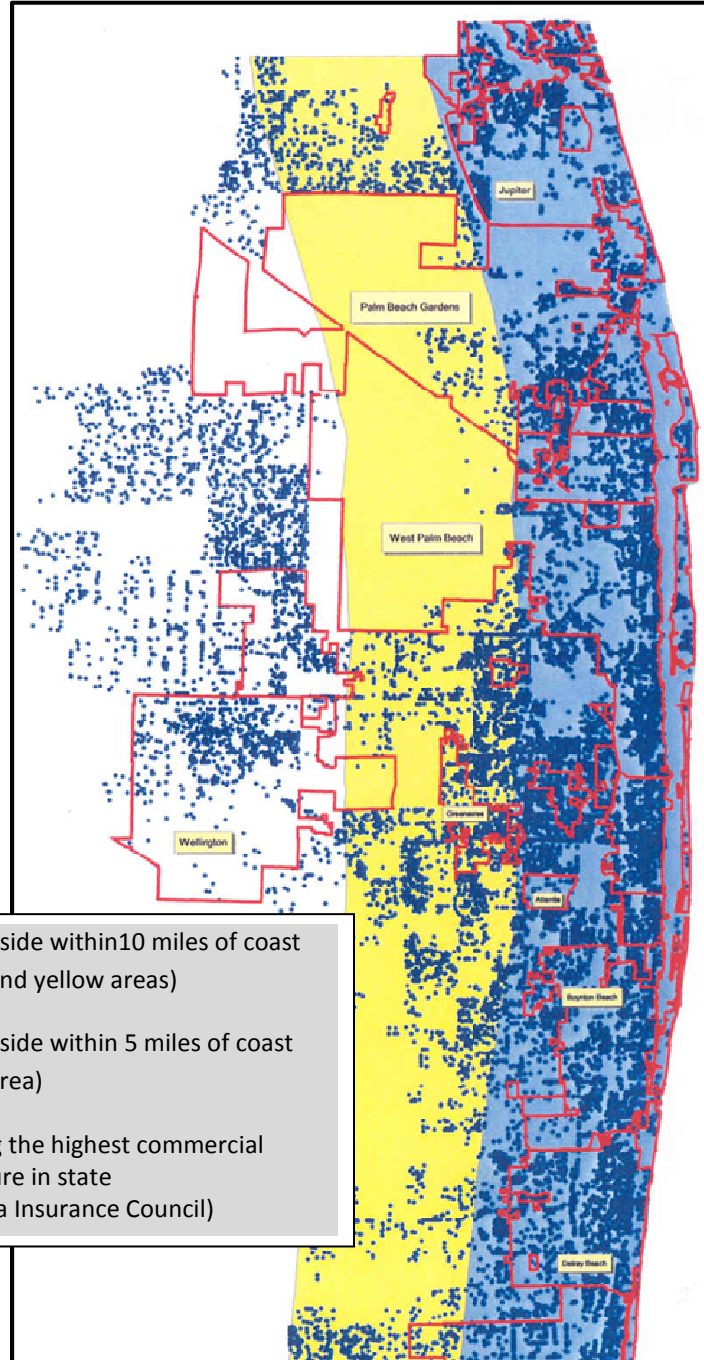
league home for the Jupiter Hammerheads and the Palm Beach Cardinals throughout the summer.

Arts & Culture

Palm Beach County boasts a wide range of cultural opportunities, including music, theater, dance, and museums. The Kravis Center for the Performing Arts hosts the Palm Beach Broadway Series, Ballet Florida, Palm Beach Opera and the Florida Philharmonic and features world-class entertainers and artists. Palm Beach County is home to many notable museums, including the renowned Norton Museum of Art which features a permanent collection of fine art and offers special exhibitions, classes, workshops and other special events. Other notable venues include the Boca Raton Museum of Art, the Flagler Museum, and The Morikami Museum and Japanese Gardens.



Distribution of Business Locations in Palm Beach County (Excluding the Glades Area)



91% reside within 10 miles of coast
(blue and yellow areas)

73% reside within 5 miles of coast
(blue area)

Among the highest commercial
exposure in state
(Florida Insurance Council)

The Built Environment

Palm Beach County has seen significant changes in its built environment over the last 10 years, as a growing population has fueled major new construction and redevelopment. Three trends have been especially apparent. The first is the creation of pace-setting high density town centers, such as Mizner Park in Boca Raton, City Place in West Palm Beach, and Abacoa in Jupiter. The second trend is the rebirth of coastal urban communities through infill and redevelopment. Examples include West Palm Beach, Delray Beach and Lake Worth, as well as Boynton Beach, Riviera Beach, and Lake Park. The third trend is the continued western expansion of development in the exurban and rural communities such as Royal Palm Beach, Wellington, the 441 corridor, Loxahatchee Groves, etc.

Redevelopment in the near coastal communities, building on the coastline, and expansion into wildland areas have implications for hurricane, surge and beach erosion and wildfire risks respectively.

The following section profiles the County's built environment as a basis for assessing its vulnerability to a range of hazards. The primary source of data for the profile was extracted from the Property Appraiser's Public Access database. It was the most accurate data source available, current as of January 2009. Data on the structural characteristics of single family residential homes came from "Exposure and Vulnerability Components of the Florida Public Hurricane Loss Projection Model published in 2005 by Florida International University, also using the Property Appraiser database.

Residential Units

Nearly 77 percent of the county's single family residential units are single story structures, 17 percent are multi-story, and 6.2 percent are manufactured homes. The residential housing stock is well distributed throughout the eastern county. Forty seven (47) percent of residential units reside in the unincorporated areas of the county. The seven municipalities of West Palm Beach, Boca Raton, Boynton Beach, Palm Beach Gardens, Jupiter, Wellington and Delray Beach collectively have about 35% of the county's residential units. The southern municipalities of Boca Raton, Delray Beach and Boynton Beach collectively have an estimated 46,348 residential units; the northern municipalities of Palm Beach Gardens and Jupiter have 25,622 units; West Palm Beach in central county has 20,377 units; and the communities of Wellington and Royal Palm Beach have 24,696 units. The western communities of Belle Glade, Pahokee and South Bay have approximately 4,850 total residential units. A breakdown of residential units by type by jurisdiction follows on the next page.

The overwhelming majority of residential structures (79%) are of CB Stucco construction. Thirteen and a half percent have exterior wall of wood in the form of wood siding, wood frame stucco or board batten. The balance is constructed of a variety of other materials. The County's database consists of approximately 25 categories, many of which have multiple variations. A breakdown of general types of construction is shown in the following chart.

Palm Beach County
Breakdown of Types of Residential Structures by Jurisdiction

Jurisdiction	Single Family/ Single Story	Single Family/ Multi-Story	Manufactured	Total
Unincorporated County	110,556	23,121	13,036	146,713
Atlantis	885	51	-	936
Belle Glade	1,921	36	842	2,799
Boca Raton	15,908	4,018	-	19,926
Boynton Beach	12,585	1,409	437	14,431
Briny Breezes	-	-	487	487
Cloud Lake	42	10	-	52
Delray Beach	9,976	1,753	262	11,991
Glen Ridge	74	17	-	91
Greenacres	3,443	1,215	704	5,362
Gulf Stream	207	143	-	350
Haverhill	517	26	40	583
Highland Beach	72	162	-	234
Hypoluxo	80	17	64	161
Juno Beach	219	126	351	696
Jupiter	9,029	2,729	447	12,205
Jupiter Inlet Colony	156	82	-	238
Lake Clarke Shores	1,036	78	-	1,114
Lake Park	1,380	44	-	1,424
Lake Worth	7,146	553	690	8,389
Lantana	2,235	171	181	2,587
Loxahatchee Groves	988	123	58	1,169
Manalapan	87	106	-	193
Mangonia Park	206	7	-	213
Ocean Ridge	263	238	-	501
Pahokee	999	38	355	1,392
Palm Beach	1,074	1,605	-	2,679
Palm Beach Gardens	9,491	3,547	379	13,417
Palm Beach Shores	305	13	-	318
Riviera Beach	6,290	631	593	7,514
South Bay	570	3	84	657
Tequesta Village	1,415	163	-	1,578
South Palm Beach	2	2	-	4
Golf Village	150	14	-	164
North Palm Beach	2,179	318	-	2,497
Palm Springs	2,179	26	253	2,458
Royal Palm Beach	6,757	2,108	-	8,865
Wellington	11,230	4,596	5	15,831
West Palm Beach	16,523	3,713	141	20,377
			-	
Countywide	238,175	53,012	19,409	310,596

Source: Property Appraiser (PAPA)

Structural Characteristics of County's Single Family Residential Buildings

Extensive research has been devoted to better understanding the most vulnerable types of structural components and connections to wind damage. The Palm Beach County building stock has been a major interest in these efforts. A 2005 study by Florida International University focuses on the roof system, roof to wall connections, wall systems, wall to foundation connections, openings, and in the case of manufactured homes the anchors into the ground as areas requiring further understanding. Damage to structures occur when load effects from wind or flying debris are greater than the component's capacity to resist them. But vulnerabilities are much more complicated than failures of individual components. When a windstorm causes damage to a structure, it will usually cause different damage modes to different components at the same time. Understanding these combinations of vulnerabilities is extremely complex.

Nevertheless, certain structural designs and materials seem to be more vulnerable than others.

Roof Covering Materials

One portion of the resistance capacity of the roof system to wind uplift includes the ability of the shingles, tiles, or other roof covering to stay attached to the roof sheathing. The loss of covering, though not vital to the structural integrity of a structure, can contribute significantly to the damage of the contents of the structure and increase insurance losses. A second, more important aspect of the wind uplift resistance capacity of the roof system includes the ability of the sheathing to remain fastened to the trusses. The third subcomponent of the roof system, the trusses or rafters, is less important to the prediction of damage. Individual trusses or rafters will not fail in uplift before massive damage has already occurred from the loss of sheathing. The contribution of the trusses or rafters to the overall capacity of the building occurs in the resistance to the loss of the entire roof as a whole unit. Post disaster studies have found that the roof to wall connection is another vital characteristic of the overall resistance of the home to hurricane force winds

Roof Types

Different roof types have different capacities to resist strong winds. The majority of roof types for single family houses in Palm Beach County are gable or hip. Gable roofs can be simply described as two pitched roof surfaces connected to vertical surfaces at each end. Hip roofs are gable roofs with gable ends brought together at the same pitch as the rest of the roof. Post disaster surveys have shown that gable roofs tended to suffer more structural damage than hip roofs.

Exterior Wall Materials

Exterior wall failures are much less commonly cited in post damage reports than roofing system failures. Residential structures in Palm Beach County are predominately of two types, concrete block and wood frame. Damage to masonry walls, especially reinforced concrete walls, is less prevalent than to wood frame walls. Both forms of wall materials are largely dependent on the integrity of the roof system for their survival.



Number of Stories

Obviously two story family buildings differ from single story structures in terms of structural characteristics, number of openings, value, etc. Most one-story buildings have either masonry exterior walls or timber frame, in other words one type of wall material. However, most multi-story buildings have mixed exterior wall material, typically concrete block walls for the first story and timber frame for the second story. For these reasons, it is assumed that everything else being equal, two story houses may be somewhat more susceptible to wind damage than single story houses.

Openings

The capacity of windows, doors, garage doors and other openings to wind pressure is the subject of great debate. The penetration of openings causes damage to homes in two ways. First, the penetrated opening allows rain and wind to enter the structure and damage the contents. Secondly, and most importantly to the structural integrity, openings allow wind to enter and create additional internal pressure which contributes to the uplift on the roof, causing failure.

Manufactured Homes

Andrew destroyed 97% of the manufactured homes in Dade County. Although manufacturing standards have improved in recent years, they remain highly vulnerable to even minor hurricanes. Tie-down systems are essential to improving survivability.

The tables below profile the Palm Beach County Housing Stock in terms of construction types and materials as estimated by Florida International University using Property Appraiser data.

**Palm Beach County
Breakdown of Residential Structures by Construction Type & Building Materials**

Component	Material	Percent
Single Family Residential Exterior Wall Material	Concrete Block/Stucco	79
	Wood Siding	9
	Wood Frame	6
	Stucco/ Hollow	
	Board & Batten	2
	Other	4
Roof Type		
1 Story Concrete Block	Gable	46
	Hip	23
1 Story Wood Frame	Gable	4
	Hip	2
2 Stories Concrete 1 st Story	Gable	8
	Hip	4
2 Stories Wood Frame	Gable	1
	Hip	1
Unknown	Other	11

Component	Material	Percent
Roof Cover Material	Tile (Concrete)	26
	Tile (Clay/Bermuda)	34
	Shingle (Asphalt)	38
	Other	2
Manufactured Homes Exterior Wall Material	Vinyl/Aluminum	81
	Wood Siding	10
	Other	9
Roof Type	Gable/Hip	51
	Flat	47
	Other	2

Palm Beach County
Number of Residential Structures by Exterior Wall Material

Construction Type	No. Structures	% Structures
Concrete Block/ Stucco	190,488	79.2
Wood Siding	16,064	6.7
Wood Frame Stucco	11,609	4.8
Board Batten & Other Wood	5,012	2.1
Vinyl/Alum Siding	7,733	3.2
Precast PNL/Reinforced Concrete	1,955	.8
Concrete Block	1,569	.6
Brick	1,951	.8
Prefab Metal/PNL	131	.1
Other	4,097	1.7

Source: Property Appraiser (PAPA)

Condos, Town Houses, Co-Ops

Palm Beach County
Condos, Town Houses, Co-Ops, Commercial Condos, Single-Family Residence
Condos, Zero Lot Line (Units)

Jurisdiction	Condo	Condo. Commercial	Co-Op	Townhouse	SFR-C	Zero Lot Line
Unincorporated County	78,708	962	0	25,066	629	37,621
Atlantis	239	33	0	43	0	10
Belle Glade	0	0	0	0	0	0
Boca Raton	15,099	1,207	98	2,511	0	2,459
Boynton Beach	11,798	352	233	3,754	0	3,119
Briny Breezes	0	0	0	0	0	0
Cloud Lake	0	0	0	0	0	0
Delray Beach	13,060	451	324	3,084	0	1,256
Glen Ridge	0	0	0	0	0	0
Greenacres City	5,324	18	0	3,060	0	2,488
Gulf Stream	126	0	63	6	0	0
Haverhill	0	0	0	0	0	44

Jurisdiction	Condo	Condo. Commercial	Co-Op	Townhouse	SFR-C	Zero Lot Line
Highland Beach	3,668	0	57	85	0	16
Hypoluxo	1,376	0	0	532	0	70
Juno Beach	1,868	46	0	256	0	0
Jupiter	7,234	895	0	5,192	0	2,949
Jupiter Inlet Colony	0	0	0	0	0	0
Lake Clarke Shores	35	19	0	279	0	0
Lake Park	805	176	0	23	0	0
Lake Worth	2,542	136	92	215	0	0
Lantana	1,217	85	62	91	0	0
Loxahatchee Groves	0	0	0	0	0	0
Manalapan	16	0	86	0	0	0
Mangonia Park	239	9	0	0	0	0
Ocean Ridge	469	0	308	96	0	0
Pahokee	21	0	0	0	0	0
Palm Beach	5,319	217	1074	48	0	0
Palm Beach Gardens	4,012	275	0	5,972	200	5,375
Palm Beach Shores	412	1	104	6	0	0
Riviera Beach	4,162	206	88	1,967	0	962
South Bay	0	0	0	0	0	0
Tequesta Village	1,286	55	0	288	0	0
South Palm Beach	1,652	1	186	15	0	0
Golf Village	0	0	0	303	0	0
North Palm Beach	4,026	140	247	133	0	0
Palm Springs	2,148	97	0	1,733	0	39
Royal Palm Beach	1,926	167	0	1,633	0	2,360
Wellington	1,339	108	0	2,026	539	3,670
West Palm Beach	13,850	642	137	4,109	101	5,016
Countywide	184,005	6,284	3,173	62,247	1,472	67,469

Age Distribution of Single Family Units

About 1.1% (7,610) of the residential stock was built before 1929; 7.6% (51,153 units) was built between 1929 and 1959; 58.2% (390,819) between 1960 and 1989; and 33.0% (221,470) between 1990 and 2008. Over 75% of residential units were built before “post Andrew” building codes were put into effect. West Palm Beach and Lake Worth have the giant share of oldest residential units in the county. Unincorporated Palm Beach County has substantial pre-1960 and pre-code units, 9,784 units and 180,295 units respectively. Not surprisingly, West Palm Beach, Wellington, Palm Beach Gardens, Jupiter, and Boynton Beach have the largest post code stocks of residential units. The table on the next page provides a detailed breakdown of residential units by year built groupings by jurisdiction.

Jurisdiction	Before 1929	1929- 1959	1960- 1989	1990- 2008	Before 6/1970	Before 6/1994
Unincorporated County	112	9,672	170,511	99,529	23,929	209,061
Atlantis	-	-	1,060	160	311	1,094
Belle Glade	1	1,670	3,079	1,476	3,216	5,501
Boca Raton	55	2,155	35,389	9,173	12,139	41,448

Jurisdiction	Before 1929	1929- 1959	1960- 1989	1990- 2008	Before 6/1970	Before 6/1994
Boynton Beach	38	3,022	22,958	11,045	7,828	28,627
Briny Breezes	-	10	399	78	204	441
Cloud Lake	-	51	9	6	53	62
Delray Beach	302	3,950	21,962	8,844	7,610	28,441
Glen Ridge	-	55	36	8	71	94
Greenacres	58	240	10,754	5,874	911	12,209
Gulf Stream	11	102	362	70	235	491
Haverhill	-	118	372	134	294	514
Highland Beach	-	85	3,309	856	477	3,499
Hypoluxo	3	87	694	1,290	115	1,138
Juno Beach	-	88	2,067	1,098	350	2,383
Jupiter	21	549	16,036	10,724	1,392	18,954
Jupiter Inlet Colony	-	67	121	49	129	197
Lake Clarke Shores	1	371	912	187	747	1,451
Lake Park	63	996	2,421	426	2,374	3,496
Lake Worth	1,585	7,148	7,956	949	11,949	16,968
Lantana	17	1,618	2,752	1,126	2,548	4,543
Loxahatchee Groves	2	37	748	333	113	885
Manalapan	1	10	209	362	43	527
Mangonia Park	9	85	367	293	137	461
Ocean Ridge	4	234	1,120	192	881	1,401
Pahokee	7	603	1,065	342	1,123	1,794
Palm Beach	1,009	1,308	6,632	1,575	4,660	9,403
Palm Beach Gardens	5	15	12,446	16,062	2,776	17,328
Palm Beach Shores	1	590	686	26	941	1,280
Riviera Beach	44	3,456	10,181	5,255	6,890	14,001
South Bay	1	126	1,066	154	459	1,277
Tequesta Village	-	78	2,265	1,086	1,253	2,391
South Palm Beach	-	67	1,825	25	407	1,892
Golf Village	-	17	107	42	68	131
North Palm Beach	1	857	6,029	887	3,292	6,906
Palm Springs	3	1,423	6,035	905	2,553	7,500
Royal Palm Beach	-	4	6,535	6,423	468	7,292
Wellington	-	7	8,628	13,427	27	11,056
West Palm Beach	4,256	10,182	21,716	20,979	18,966	38,261
Countywide	7,610	51,1533	390,819	221,470	121,939	504,398

Residential Units by Year Built by Jurisdiction

Source: Property Appraiser (PAPA)

Non-Residential Building Stock

The following two tables provide a breakdown of commercial, industrial, government, educational, healthcare, religious and other non-residential structures by jurisdiction and by age category. Eighty one percent were built since 1960, but 82% predate current codes.

Palm Beach County
Non-Residential Units by Year Built Groupings by Jurisdiction

Jurisdiction	Before 1929	1929 -1959	1960- 1989	1990 -2008	Before 6/1970	Before 6/1994
Unincorporated County	11	915	5,184	2,170	2,035	6,766
Atlantis	-	-	24	16	8	28
Belle Glade	6	265	410	103	470	720
Boca Raton	16	155	1,433	534	570	1,746
Boynton Beach	16	208	685	372	402	1,013
Briny Breezes	-	-	22	1	22	23
Cloud Lake	-	4	-	-	4	4
Delray Beach	71	490	974	359	849	1,646
Glen Ridge	-	2	4	-	3	6
Greenacres City	1	23	212	77	59	259
Gulf Stream	2	1	18	4	8	23
Haverhill	-	4	18	17	13	23
Highland Beach	-	1	16	6	9	17
Hypoluxo	2	9	51	5	13	63
Juno Beach	2	6	52	31	20	68
Jupiter	10	54	601	347	174	752
Jupiter Inlet Colony	-	-	1	1	-	2
Lake Clarke Shores	-	1	28	2	7	29
Lake Park	10	31	335	55	198	388
Lake Worth	68	433	548	105	704	1,087
Lantana	7	87	204	45	177	315
Loxahatchee Groves	-	1	68	41	6	70
Manalapan	-	2	6	1	2	9
Mangonia Park	-	3	136	54	23	159
Ocean Ridge	-	2	16	1	8	18
Pahokee	4	101	141	23	186	251
Palm Beach	82	114	105	34	222	317
Palm Beach Gardens	-	1	398	311	102	488
Palm Beach Shores	-	16	6	3	19	22
Riviera Beach	6	267	720	253	546	1,055
South Bay	-	30	100	32	68	140
Tequesta Village	-	8	105	30	47	121
South Palm Beach	-	-	3	-	1	3
Golf Village	-	5	13	3	6	18
North Palm Beach	-	18	211	34	104	236
Palm Springs	-	95	218	52	166	327
Royal Palm Beach	-	7	162	260	18	220
Wellington	-	5	335	591	18	438
West Palm Beach	241	1,153	1,547	594	1,936	3,125
Countywide	555	4,517	15,110	6,567	9,223	21,995

Source: Property Appraiser (PAPA)

Average Age and Value of Structures

The table below depicts the average age and value of structures in each jurisdiction.

Palm Beach County
Average Value & Age by Jurisdiction (All Structures)

Jurisdiction	Avg. Value	Avg. Year Built	Average Age
Unincorporated County	\$178,598	1985	23
Atlantis	\$239,998	1978	30
Belle Glade	\$116,297	1969	39
Boca Raton	\$352,687	1979	29
Boynton Beach	\$161,181	1981	27
Briny Breezes	\$15,426	1975	33
Cloud Lake	\$79,538	1955	53
Delray Beach	\$214,955	1978	30
Glen Ridge	\$123,812	1962	46
Greenacres City	\$151,313	1986	22
Gulf Stream	\$627,879	1971	37
Haverhill	\$124,592	1975	33
Highland Beach	\$493,047	1982	26
Hypoluxo	\$195,424	1991	17
Juno Beach	\$378,949	1985	23
Jupiter	\$255,444	1988	20
Jupiter Inlet Colony	\$383,369	1973	35
Lake Clarke Shores	\$169,454	1972	36
Lake Park	\$151,023	1968	40
Lake Worth	\$115,513	1960	48
Lantana	\$158,181	1973	35
Loxahatchee Groves	\$122,309	1983	25
Manalapan	\$1,339,204	1981	27
Mangonia Park	\$163,086	1973	35
Ocean Ridge	\$396,280	1974	34
Pahokee	\$90,445	1965	43
Palm Beach	\$735,800	1967	41
Palm Beach Gardens	\$300,559	1989	19
Palm Beach Shores	\$515,615	1967	41
Riviera Beach	\$211,140	1977	31
South Bay	\$133,317	1972	36
Tequesta Village	\$234,898	1980	28
South Palm Beach	\$246,941	1975	33
Golf Village	\$318,134	1977	31
North Palm Beach	\$211,591	1973	35
Palm Springs	\$127,800	1975	33
Royal Palm Beach	\$186,768	1991	17
Wellington	\$266,001	1993	15
West Palm Beach	\$223,133	1975	33
Countywide	\$218,355	1982	26

Source: Property Appraiser (PAPA)

Number of Addresses in Special Flood Hazard Areas

A total of 109,151 addresses in 24 municipalities and unincorporated Palm Beach County are located with Special Flood Hazard Areas (A Zones). These addresses are widely scattered throughout the County.

Palm Beach County
Number of Addresses in Special Flood Hazard Areas

Jurisdiction	No. Addresses
Atlantis	222
Boca Raton	9,181
Boynton Beach	11,872
Cloud Lake	14
Delray Beach	9,567
Gulf Stream	217
Haverhill	503
Highland Beach	2,417
Juno Beach	222
Jupiter	7,056
Lake Park	931
Lake Worth	1,392
Lantana	1,416
Manalapan	248
Mangonia Park	35
North Palm Beach	3,173
Ocean Ridge	1,231
Palm Beach	4,766
Palm Beach Gardens	1,400
Palm Springs	2,690
Riviera Beach	3,960
South Palm Beach	1,225
Tequesta	432
West Palm Beach	11,997
Unincorporated PBC	48,760
Countywide Total	157,669

Source: NFIP

Coastal High Hazard Areas

In May 2002, the Florida Legislature amended Section 163.3191(2)(m) Florida Statutes (F.S.) to require the following:

“If any of the jurisdiction of the local government is located within the coastal high-hazard area, an evaluation of whether any past reduction in land use density impairs the property rights of current residents when redevelopment occurs, including, but not limited to, redevelopment following a natural disaster. The property rights of current residents shall be balanced with public safety considerations. The local government must identify strategies to address redevelopment feasibility and the property rights of affected residents. These strategies may include the authorization of redevelopment up to the actual built density in existence on the property prior to the natural disaster or redevelopment.”

The State of Florida defines Coastal High Hazard Areas (CHHA) in Chapter 163-3178(2)(h) as: “the evacuation zone for a category one hurricane as established in the regional hurricane evacuation study applicable to the local government”.

Since 2003, Palm Beach County has maintained a more stringent definition which includes evacuation zones for hurricane categories one and two.

Most of the unincorporated CHHA lands are located in the northern section of Palm Beach County. The land uses for these lands are low residential, medium residential, high residential, commercial, parks, conservation, institutional, and industrial. A small segment of the CHHA lands are located in the southern area of the County near the municipalities of Briny Breezes and Gulf Stream. These land uses are medium residential, high residential, commercial, and park. The majority of the CHHA land is located within 23 municipal boundaries and is therefore not addressed.

Below is a table listing the existing land uses and total acres in the unincorporated areas of Palm Beach County’s Coastal High Hazard Area.

Unincorporated Palm Beach County Existing Land Use Total Acres	
Land Use	Total Acres
Agriculture	2.85
Commercial	11954.87
Conservation	4868.28
Industrial	245.28
Institutional	1688.74
Mixed Use	22.26
Recreation/Open Space	2154.22
Residential Mobile Home	272.47
Residential Multi-Family	7373.17
Residential Single Family	14688.51
Utility/Transportation	121.55
Vacant	6677.30

Source: Palm Beach County Planning, Zoning, Building

Number of Addresses in the Coastal High Hazard Area

Countywide there are over 48,000 addresses located within the Coastal High hazard Area. The highest concentrations of addresses are located in the northern and southern municipalities of the county near the Jupiter and Boca inlets. The database does not permit a breakout by units.

Palm Beach County
Number of Addresses in the Coastal High Hazard Area

Jurisdiction	No. Addresses
Atlantis	222
Boca Raton	4,395
Boynton Beach	4,095
Briny Breezes	348
Delray Beach	3,088
Gulf Stream	160
Highland Beach	2,315
Hypoluxo	1,353
Juno Beach	1,023
Jupiter	6,632
Jupiter Inlet Colony	81
Lake Park	662
Lake Worth	616
Lantana	1,247
Manalapan	204
North Palm Beach	5,181
Ocean Ridge	1,064
Palm Beach	3,914
Palm Beach Gardens	455
Palm Beach Shores	264
Riviera Beach	2,695
South Palm Beach	1,148
Tequesta	855
West Palm Beach	2,403
Unincorporated County	3,862
Countywide Total	48,024



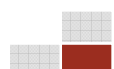
Critical Facilities by Jurisdiction

Palm Beach County defines critical facilities as including essential government facilities, fire and police facilities, hospital and health care facilities, nursing homes and assisted living facilities, schools and shelter facilities, airports, water treatment plants, water control district facilities, and waste water treatment facilities. The chart below shows a breakdown in the number of facilities by jurisdiction.

Palm Beach County
Critical Facilities by Jurisdiction

Jurisdiction	Number Critical Facilities
Unincorporated County	106
Atlantis	4
Belle Glade	6
Boca Raton	24
Boynton Beach	23
Delray Beach	18
Greenacres	6
Gulf Stream	1
Highland Beach	2
Juno Beach	3
Jupiter	14
Jupiter Inlet Colony	1
Lake Clark Shores	1
Lake Park	3
Lake Worth	12
Lantana	5
Manalapan	2
Mangonia Park	1
North Palm Beach	2
Ocean Ridge	2
Pahokee	3
Palm Beach	4
Palm Beach Gardens	17
Palm Beach Shores	2
Palm Springs	2
Riviera Beach	7
Royal Palm Beach	7
South Bay	1
South Palm Beach	1
Tequesta	6
Wellington	9
West Palm Beach	58
Countywide	353

Source: Property Appraiser (PAPA)



Palm Beach County Building Codes & Practices

The building departments of the county and its municipalities continuously seek improved standards and measures for protecting public safety, health and welfare by ensuring that all construction within their jurisdictions conforms with applicable building codes, ordinances, laws, rules, resolutions and regulations. Their collective mission is to enact and enforce effective codes and standards to ensure the structural strength, sanitation, fire protection, adequate light and ventilation, and other essential elements of life safety in the built environment, including the creation of a more disaster resilient community.

The Florida Building Code is the core element of Palm Beach County's building code system. The single statewide unified code is administered and enforced by local jurisdictions. In accordance with local needs and circumstances, and as authorized by law, code requirements, in some instances, have been amended by officials to be more stringent. Palm Beach County's codes are among the most rigorous in the U.S. in terms of disaster protection.

The provisions of the county's local building codes apply to the construction, erection, alteration, modification, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every public and private building, structure or facility or floating residential structure, and any appurtenances connected or attached to such buildings, structures or facilities.

The County has an active Building Code Advisory Board with the mission of making recommendations to the Board of County Commissioners and local governments on ways to enhance building-related codes and standards and, as it makes sense, promote uniformity in standards.

The Building Officials Association of Palm Beach County (BOAPBC), a non-profit organization comprised of code professionals including Building Officials, Inspectors, Plans Examiners, Architects, Engineers, Contractors, Industry Members, and others mutually interested in the promotion and enhancement of public safety, is also active in promoting the diligent and consistent enforcement of applicable construction codes and regulations throughout Palm Beach County.

In 2004 The County's Building Department and the Division of Emergency Management collaborated on enhancing the county's Flood Damage Prevention Ordinance to better regulate building construction in geographic areas identified by the county and FEMA as especially susceptible to flooding. The comprehensive, updated Ordinance followed and was compliant with the FEMA model. Important enhancements to the ordinance included the establishment of more stringent standards on minimum floor elevations relative to adjacent road elevations and minimizing displacement of flood volumes to neighboring properties by limiting the amount of imported earth fill that can be brought onto lots.

At this writing, the Florida Building Code has been changed. The County is reviewing the new code in terms of its impacts on local codes and practices. Likely the County's Flood Prevention Ordinance will need to be modified substantially or rewritten in line with the State Code changes.

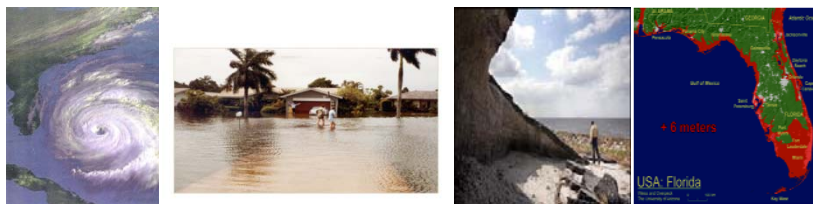
HAZARD ANALYSIS & RISK ASSESSMENTS

This section contains:

- Primary hazard assessments at a Glance
- Detailed hazard analysis of the four categories of hazards that have the greatest potential for creating catastrophic disasters in Palm Beach County.

Additional information can be found in the respective Hazard Specific Plan for each hazard on file in the Palm Beach County Division of Emergency Management. A copy of hazard assessments from the Local Mitigation Strategy plan is contained in Appendix D.

Primary Hazard Vulnerability Assessments at a Glance



Hurricanes

Overall Assessment:

- High probability
- High risk
- High impact
- Significant probability for major/catastrophic consequences

Previous Occurrences:

- 24 hurricanes within 60 miles of Palm Beach 1900 – 2010
- 11 direct hits; 5 back to back; 8 brushes
- 2 Category 4 and 2 Category 3 storms
- Strongest sustained winds: 150 mph
- No recorded storms of Category 5 intensity
- Floyd would have exceeded 150 mph winds had it made landfall

Likelihood of Future Occurrences:

- Category 1 to Category 4 a certainty
- Return period all storms: 6.57 years

- Return period major hurricanes (Category 3 or higher): 13 years

Areas at Greatest Risk:

- Entire County; coastal and western lake communities have highest risk

Population at Risk:

- 1.3 million
- 88% live within 10 miles of the coast

Risks to Life/Safety:

- Significant
- Particularly special needs population, elderly, poor, homeless

Structures/Infrastructure at Risk:

- 86% of 310,600 residential structures reside within 10 miles of coast
- 93% of 2,146 non-residential structures reside within 10 miles of coast
- 353 critical facilities are at risk
- 13% of residential and non-residential are located within evacuation zone

Economic/Social Impacts:

- Tremendous
- Exposure could exceed \$100 billion

Environmental Impacts:

- Far reaching
- Coastal species/habitats particularly vulnerable

Inland Flooding

Overall Assessment:

- High probability
- Moderate risk
- Moderate to low impact
- Low to moderate probability for major/catastrophic consequences

Previous Occurrences:

- Over a third of Florida's declared disasters involve flooding
- Palm Beach County recorded 25 significant flood events between 1947 and 2009
- The National Climate Data Center lists 17 County flood events during the period 1950 to 2009 on their "severe flood events list."
- Several years between 1978 and 1995 experienced in excess of 80 inches of rain, causing extensive flooding

Likelihood of Future Occurrences:

- High probability of flash flooding from intense rain events
- High probability of flooding from tropical storm events
- County has highest rainfall levels in South Florida
- Average time between significant flooding events is 2.3 years

- Several years have experienced multiple flood events
- The best predictors available are flood zone designations assigned by the NFIP
- Zone A areas have the greatest risk; Zones B, C, and X have somewhat lower risks

Areas at Greatest Risk:

- Entire county susceptible because of flat terrain and widespread water bodies
- Significant flooding occurs outside designated Special Flood Hazard Areas
- Eastern communities flood more than central and western communities

Population at Risk:

- Flash flooding tends to be scattered and a risk only to a few neighborhoods at a time

Risks to Life/Safety:

- Low to moderate risk
- Drowning from inland flooding is rare in Palm Beach County
- Life/safety risks associated with pooling more than water movement; electrocution
- Street flooding can create dangerous driving conditions; some isolated deaths from accidentally driving into canals
- Overflow of wastewater and septic systems can produce health problems

Structures/Infrastructure at Risk:

- In-structure inland flooding is not widespread; most homes built on elevated pads
- Street and yard flooding is common; isolation and loss of function can be problems
- There are approximately 280 repetitive flood loss properties countywide, most widely scattered throughout the eastern corridor
- The most flood prone areas: northern and central communities; barrier islands.
- Zone A structures have a 26% chance of flooding over the life of a 30 year mortgage

Economic/Social Impacts:

- Significant if there is widespread flooding
- Loss of commercial access can be costly

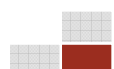
Environmental Impacts:

- Low to moderate

Dike Failure

Overall Assessment:

- Moderate to high probability
- High risk
- High impact



- Significant probability for major/catastrophic consequences

Previous Occurrences:

- 1926 Category 4 hurricane caused overtopping (killed 300)
- 1928 Category 4 hurricane caused massive failure (official 2,500 deaths; more likely 5,000-6,000)
- 1947 near catastrophes from two hurricanes
- 2004 & 2005 three Category 2 storms caused minor structural damage to the dike

Likelihood of Future Occurrences:

- Army Corps cautions that a failure could be imminent without mitigation and management of lake levels
- 2007 USACE report stated 50% chance of breach within 3 years and virtual certainty within 5-7 years without intervention.
- Cut wall now installed in most of Reach1 has reduced risk of wall failure
- Category 1 to Category 4 hurricanes a virtual certainty
- Return period all storms: 6.57 years
- Return period major hurricanes (Category 3 or higher): 13 years

Areas at Greatest Risk:

- Western communities (Belle Glade, Pahokee, South Bay, Canal Point)
- Potential to reach western boundary communities of the eastern corridor
- (Wellington, Royal Palm Beach, Loxahatchee); inundation models still being developed by USACE

Population at Risk:

- 40,000 residents of western communities; unknown number of transient workers
- Ranked second most vulnerable area to hurricanes in the U.S. (behind New Orleans) in 2006 by the International Hurricane Research Center study

Risks to Life/Safety:

- Significant
- Particularly special needs population, elderly, poor, migrants, prisoners. non-evacuees

Structures/Infrastructure at Risk:

- 4,850 residential structures estimated to be at risk
- 761 non-residential structures estimated to be at risk
- 10 critical facilities are at risk

Economic/Social Impacts:

- Potentially significant loss of agricultural lands and crops
- Death toll likely to be significant because of anticipated low voluntary evacuation rates

Environmental Impacts:

- Far reaching

- Coastal species/habitats particularly vulnerable

Sea Level Rise

Overall Assessment:

- High probability of continued rise; uncertainty on rate of change
- High risk of long-term consequences
- High potential impact
- Significant probability for eventual major/catastrophic consequences

Previous Occurrences:

- Steady but marginal rise has been measured
- Progressive development of coastal erosion and salt water intrusion are concerning; could increase vulnerability to sea level rise-associated consequences

Likelihood of Future Occurrences:

- Continued gradual sea level rise appears to be a certainty in the near term
- Some scientists believe the rate of rise will increase; no evidence of that yet
- Highly divergent projections on rates of rise

Areas at Greatest Risk:

- 23 of the county's 38 municipalities are susceptible to the effects of sea level rise
- Municipalities bordering the Atlantic Ocean and Intracoastal Waterway are most at risk
- Jupiter, Singer Island and area from Lake Worth Pier to Lantana are erosion hot spots
- The cost and effectiveness of beach and dune re-nourishment are under question
- SFWMD estimates that salt water intrusion already reaches 3 miles inland along some parts of coast (Lantana, Lake Worth and Manalapan are front line defense)

Population at Risk:

- Populations on the barrier islands and in areas contiguous to the ocean and coastal waterways are at greatest risk

Risks to Life/Safety:

- Low in near term
- Expanded threat of coastal storm surge could become a problem without adaptation measures

Structures/Infrastructure at Risk:

- Structures/infrastructure on coastlines in erosion areas are at greatest near-term risk
- Some structures are already at risk of collapse

Economic/Social Impacts:

- Beach re-nourishment and dune restoration costs will continue to mount
- Significant investments in desalination technologies will be required
- Adaptation and retreat measures will be costly

- Insurance will become increasingly cost prohibitive or unavailable

Environmental Impacts:

- Far reaching
- Coastal species/habitats particularly vulnerable
- Vast freshwater wetlands could become saltwater marshes
- Threat to rare and endangered habitats indigenous to Florida Keys for which there is no opportunity for inland migration
- Salt water intrusion into sole source Biscayne Aquifer may require investments in desalination technology

Hazard Analysis

Hurricanes & Tropical Storms

Of all of the natural, human-caused, technological and environmental hazards common to Palm Beach County, hurricanes and tropical storms have the greatest potential for causing major or catastrophic disaster events.

About Hurricanes & Tropical Storms

Hurricanes and tropical storms are intense low pressure systems originating in the tropics, capable of producing tremendously strong winds of 155 miles per hour or more, heavy rainfall, tornadoes, microbursts, and coastal storm surge. They are the two most intense forms of tropical cyclones, nature's most damaging large-scale weather systems. Hurricanes have been responsible for massive destruction and loss of life. Although less intense in terms of wind damage, Tropical storms can generate extensive rain-induced flooding events. Hurricanes and tropical storms affect most tropical and subtropical parts of the world. Palm Beach County has among the highest strike probabilities in the U.S. for hurricanes and tropical storms.

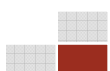
Where & When Atlantic/Caribbean Hurricanes Form

In May and June of each year (the early part of the Atlantic hurricane season) the majority of hurricanes occur in the western Caribbean. By July and through August and September (the peak of the hurricane season and the primary period for African originated storms) the main breeding ground for severe cyclonic storms shifts to the southeastern part of the Caribbean, although activity during this period can occur anywhere throughout most of the Caribbean and Gulf of Mexico. By October, the majority of hurricane formation again occurs in the western Caribbean.

The Progressive Stages of Hurricane Development

The progressive stages or levels of disturbed weather leading up to a hurricane are defined as follows:

Tropical Waves



Tropical waves, also known as African easterly waves in the Atlantic region, are a type of atmospheric trough with an elongated area of relatively low pressure areas oriented north to south, which move from east to west across the Tropics causing areas of cloudiness and thunderstorms. Tropical waves in the Atlantic basin develop from disturbances which drift off the continent of Africa onto the Atlantic Ocean. These are generated or enhanced by the Easterly African Jet Stream.

Tropical Disturbances

A discrete tropical weather system of apparently organized convection (generally 100 to 300 nautical miles in diameter), originating in the tropics or subtropics, having a non-frontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

It is often the first developmental stage of any subsequent tropical depression, tropical storm or hurricane. These low-pressure areas feature weak pressure gradients and little or no rotation. Most of these disturbances die out, but a few persevere down the path to hurricane status.

It can take anywhere from hours to days for a tropical disturbance to develop into a hurricane. But if the cycle of cyclonic activity continues and wind speeds increase, the tropical disturbance progresses through the following stages of tropical cyclone development:

Tropical Depressions

A tropical depression is a tropical cyclone in which the maximum sustained wind speed (using the U.S. 1 minute average standard) is up to 38 mph. Depressions have a closed circulation. They may form slowly from a tropical disturbance or an easterly wave which has continued to organize.

Tropical Storms

A tropical storm is a tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1 minute average standard) ranges from 39 mph to 73 mph, the convection in tropical storms is usually more concentrated near the center with outer rainfall organizing into distinct bands.

Hurricanes

When winds in a tropical cyclone equal or exceed 74 mph in the Atlantic and eastern and central Pacific Oceans it is labeled a hurricane.

Hurricanes are further designated by categories 1 through 5 on the Saffir-Simpson scale according to wind speeds and barometric pressure. Hurricanes in categories 3, 4, 5 are known as major or intense storms. Better organized hurricanes display a clear eye.

Severity

Hurricanes are capable of mass destruction and have been one of North America's most costly disasters. The final cost of Hurricane Katrina has exceeded half of a trillion dollars, making it the costliest disaster in history. Fortunately, hurricanes are relatively slow moving, which often allows for adequate warning for preparation and evacuation of people living in areas where hurricanes threaten. However, hurricanes cover a large area and can sometimes unexpectedly change their direction and intensity, catching people unprepared.

Saffir-Simpson Scale

The destructive power of hurricanes is generally considered to be highly correlated with wind speed. Historically, the most widely used gage for assessing the severity of hurricane winds has been the Saffir-Simpson Wind Scale. A number of deficiencies in the scale have surfaced in recent years. Scientists point out that the scale is based exclusively on maximum wind speeds attained (maximum winds are often widely isolated and of short duration), it correlates poorly with storm surge, it does not consider storm size or the scope of a hurricane's wind field and, it does not yield particularly good estimates of potential damage.

The National Weather Service has recently modified the Saffir-Simpson Hurricane Wind Scale, dropping all references to storm surge values. Below are damage descriptions categorized by wind intensity as contained in NWS's modified Saffir-Simpson Hurricane Wind Scale:

Damage Profiles by Sustained Wind Categories (Based on Saffir-Simpson Scale)

74-95 mph (64-82 kt or 119-153 km/hr). “Some Damage”

Some damage to building structures could occur, primarily to unanchored mobile homes (mainly pre-1994 construction). Some damage is likely to poorly constructed signs. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possible death. Numerous large branches of healthy trees will snap. Some trees will be uprooted, especially where the ground is saturated. Many areas will experience power outages with some downed power poles.

96-110 mph (83-95 kt or 154-177 km/hr). “Widespread Damage”

Very strong winds will produce widespread damage. Some roofing material, door, and window damage of buildings will occur. Considerable damage to mobile homes (mainly pre-1994 construction) and poorly constructed signs is likely. A number of glass windows in high rise buildings will be dislodged and become airborne. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possible death. Numerous large branches will break. Many trees will be uprooted or snapped. Extensive damage to power lines and poles will likely result in widespread power outages that could last a few to several days.

111-130 mph (96-113 kt or 178-209 km/hr). “Extensive Damage”

Dangerous winds will cause extensive damage. Some structural damage to houses and buildings will occur with a minor amount of wall failures. Mobile homes (mainly pre-1994 construction) and poorly constructed signs are destroyed. Many windows in high rise buildings will be dislodged and become airborne. Persons struck by windborne debris risk injury and possible death. Many trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.

131-155 mph (114-135 kt or 210-249 km/hr). “Devastating Damage”

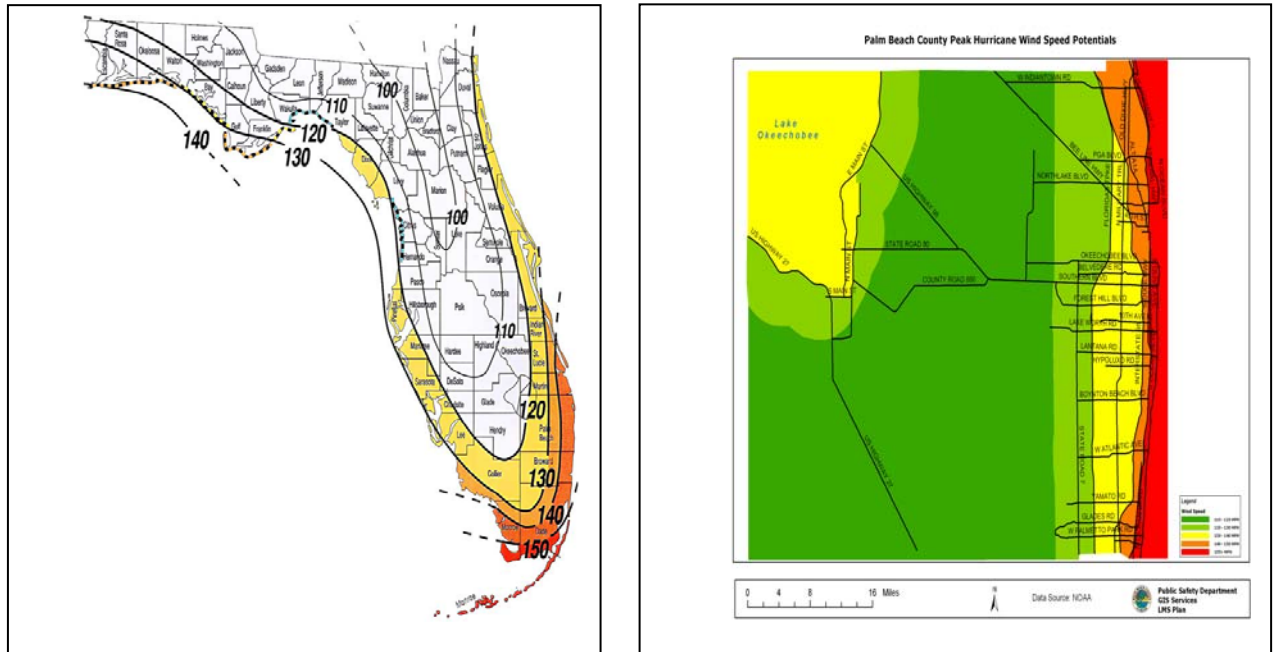
Extremely dangerous winds causing devastating damage are expected. Some wall failures with some complete roof structure failures on houses will occur. All signs are blown down. Complete destruction of mobile homes (primarily pre-1994 construction). Extensive damage to doors and windows is likely. Numerous windows in high rise buildings will be dislodged and become airborne. Windborne debris will cause extensive damage and persons struck by the wind-blown debris will be injured or killed. Most trees will be snapped or uprooted. Fallen trees could cut off residential areas for days to weeks. Electricity will be unavailable for weeks after the hurricane passes. Long-term recovery likely.

Winds greater than 155 mph (135 kt or 249 km/hr). “Catastrophic Damage”

Catastrophic damage is expected. Complete roof failure on many residences and industrial buildings will occur. Some complete building failures with small buildings blown over or away are likely. All signs blown down. Complete destruction of mobile homes (built in any year). Severe and extensive window and door damage will occur. Nearly all windows in high rise buildings will be dislodged and become airborne. Severe injury or death is likely for persons struck by wind-blown debris. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Recovery could take years.

Peak Wind Potentials for Palm Beach County

The left hand map below shows the Southeast Florida and Palm Beach County maximum wind zones recognized by the Florida Building Code. The right hand map shows the maximum speed lines for Palm Beach County using NOAA data.



Florida Building Code

According to NOAA data, the right hand map above is color coded to indicate maximum hurricane wind speeds.

- The Red area, essentially east of U.S. 1 could potentially see top winds of 150 mph or higher.
- The Orange area, with peak winds between 140 and 150 mph, extends west to I 95.
- The Yellow area, with peak winds of 130 to 140 mph, extends west to the Florida Turnpike.
- The Light Green area, with peak winds of 120 to 130 mph, extends to the western boundaries of Wellington and the Acreage.
- The Dark Green area with peak winds of 110 to 120 mph extends to the Everglades and agriculture area.
- The communities bordering Lake Okeechobee could see peak winds of up to 130 mph.
- Lake Okeechobee could see peak winds of 130 to 140 from either easterly or westerly moving storms.

Severity of Previous Palm Beach County Hurricanes

Between 1903 and 2008, 17 hurricanes and tropical storms passed directly through Palm Beach County. Of these, 9 occurred between 1903 and 1950. Two of the 9 were Category 4 storms and one was a Category 3 storm. Since 1950 only one of 8 storms (Jeanne) that passed through Palm Beach County briefly reached minimal Category 3 strength.

The strongest recorded hurricane winds in Palm Beach County occurred with the deadly 1928 Okeechobee hurricane. That storm recorded maximum sustained winds of 150 mph with a barometric pressure of 928.9 millibars (the 4th lowest in Florida history). Peak gusts reached nearly 160 mph at Canal Point. The 1928 storm still ranks as the second most deadly storm in U.S. history. The official death toll was 2,500 (although the actual number, according to witness reports, was likely more than twice that number).

Three recent hurricanes (Frances and Jeanne in 2004) and Wilma (2005) were Category 2 storms. Jeanne may have briefly reached minimum Category 3 status. Wilma set a new all time record low central pressure of 882 mb while it was in the Atlantic Basin.

Had Hurricane Andrew (1992) or Floyd (1999) made landfall in Palm Beach County, they would have brought winds in excess of 150 mph.

Collectively Frances, Jeanne, and Wilma caused more than \$2.4 billion in damage in a two year period. All three of these storms rank in the 10 most costly U.S. Hurricanes. When all storms are adjusted to 2004 dollars, Frances and Jeanne still rate in the top 10. Wilma probably will still make the list when adjustments are made to 2005 dollars.

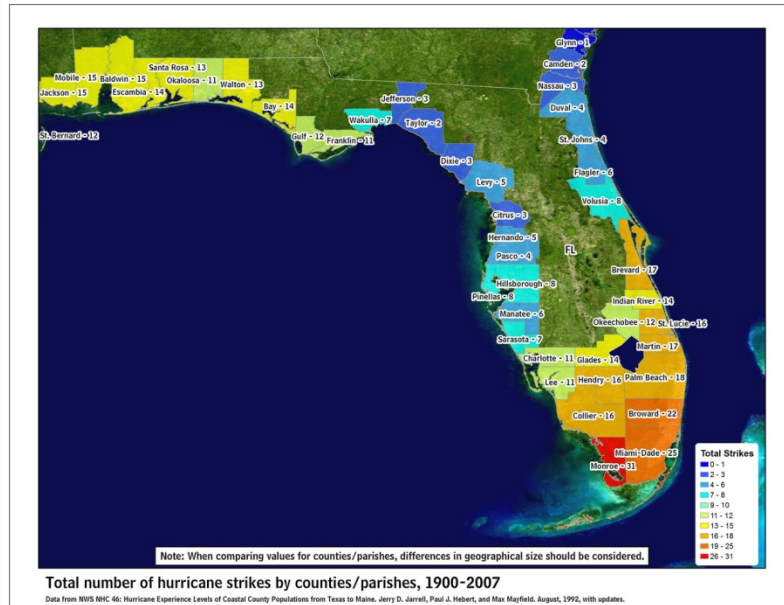
Location, Location, Location

Florida has experienced the greatest number of hurricane landfalls of any state in the nation because of its geographic location. Florida's flat topography also makes it susceptible to the full force of hurricane winds and powerful storm surge. Between 1900 and 2006, Florida was impacted by 68 hurricanes, 31 of which were major hurricanes (Category 3 or higher). Since 1851 only eighteen hurricane seasons passed without a known hurricane or tropical storm impacting the state.

Tropical cyclones have affected Florida in every month of the year but January and March. Nearly one-third of the cyclones affected the state in September, and nearly three-fourths of the storms affected the state between August and October, thus representing the peak of the hurricane season.

Portions of the Florida coastline have the lowest return period, (i.e. the highest frequency at which a certain intensity or category of hurricane can be expected within 86 miles of a given location in the country. Monroe County has been struck by 26 hurricanes since 1926, the greatest total for any county in the United States.

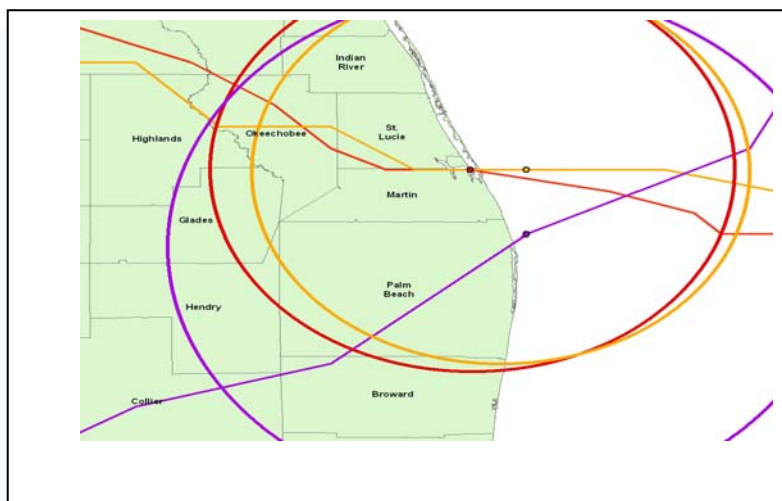
Palm Beach County has among the highest strike probabilities in the U.S. The map below shows a breakdown of Florida counties by number of hurricane strikes between 1900 and 2007.



With 18 hurricanes, Palm Beach County trails Miami Dade (25) and Broward County (22) for the period 1900 to 2007. Monroe County leads all counties with 31 hurricanes.

All areas of Palm Beach County are susceptible to, and have in fact been impacted by, major hurricane force winds. Although not major hurricanes, virtually the entire county was impacted by three Category 2 storms in the one year period between September 2004 and October 2005. The map below shows the reach of hurricane strength wind fields for the three storms, Hurricanes Frances, Jeanne, and Wilma.

Areas of Palm Beach County impacted by hurricane strength winds Hurricanes Frances and Jeanne (2004) and Wilma (2005)



Frances 9/5/2004
Jeanne 9/25/2004
Wilma 10/24/2005

Source: DEM GIS.

Page 46 of 257
Volume 2: PDRP

When Hurricanes Hit Palm Beach County

Of the last 18 hurricanes and significant tropical storms to hit Palm Beach County, 2 occurred in the month of July, 4 in August, 8 in September, and 4 in October. The earliest date for a hurricane to strike Palm Beach County was July 27 (1926). The latest to hit the county was Wilma on October 24 (2005). The most active time of the year is from August 27 to September 17. Eight hurricanes have occurred during this period.

The most active period for hurricanes was between 1920 and 1950 when 10 storms hit the county, of which 2 were Category 4 storms and 3 were significant tropical storms. Unusually quiet periods were experienced between 1907 and 1925 (0 hurricanes), 1951 and 1979 (4 storms), and 1980 and 1995 (0 hurricanes). The last official hurricane to produce sustained Category 3 or higher winds in Palm Beach County occurred on August 27, 1949. Multiple hurricane years have occurred in Palm Beach County in 1928, 1947 and 2004.

Previous Occurrences

Palm Beach County Hurricanes & Tropical Storms (1900 – 2008)

According to HurricaneCity.com, between 1900 and 2008, Palm Beach County was affected by 24 hurricanes that came within 60 miles of the Town of Palm Beach. Of these:

- 11 were direct hits
- 5 were back door storms (coming from the southwest or west)
- 8 were brushes

- 8 were Category 1
- 3 were Category 2
- 2 were Category 3
- 2 were Category 4
- 0 were Category 5
- 9 were of unknown strength

During the same period, the County experienced 13 recorded tropical storms. They included:

- 6 were direct hits
- 5 were back door storms
- 2 were brushes

At this writing the latest significant tropical storm to impact the county was Fay in 2008.



1928 Storm Damage - WPB



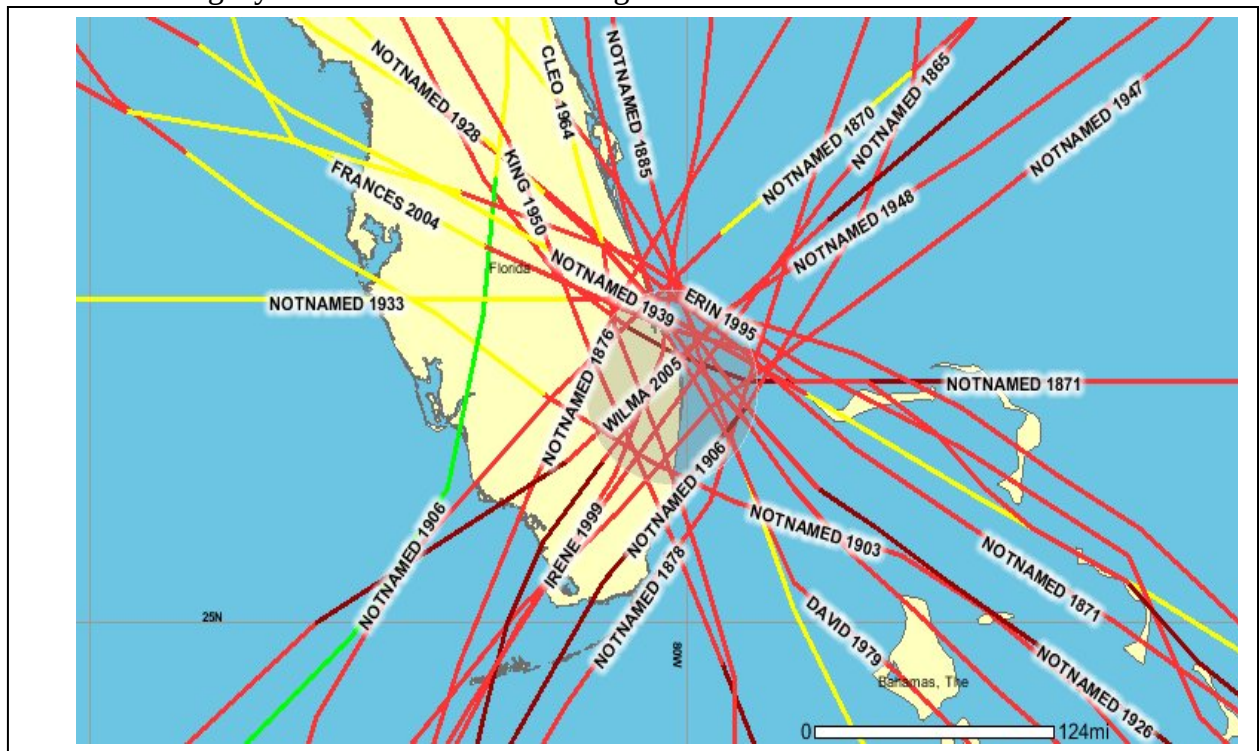
Wilma - Boca Damage



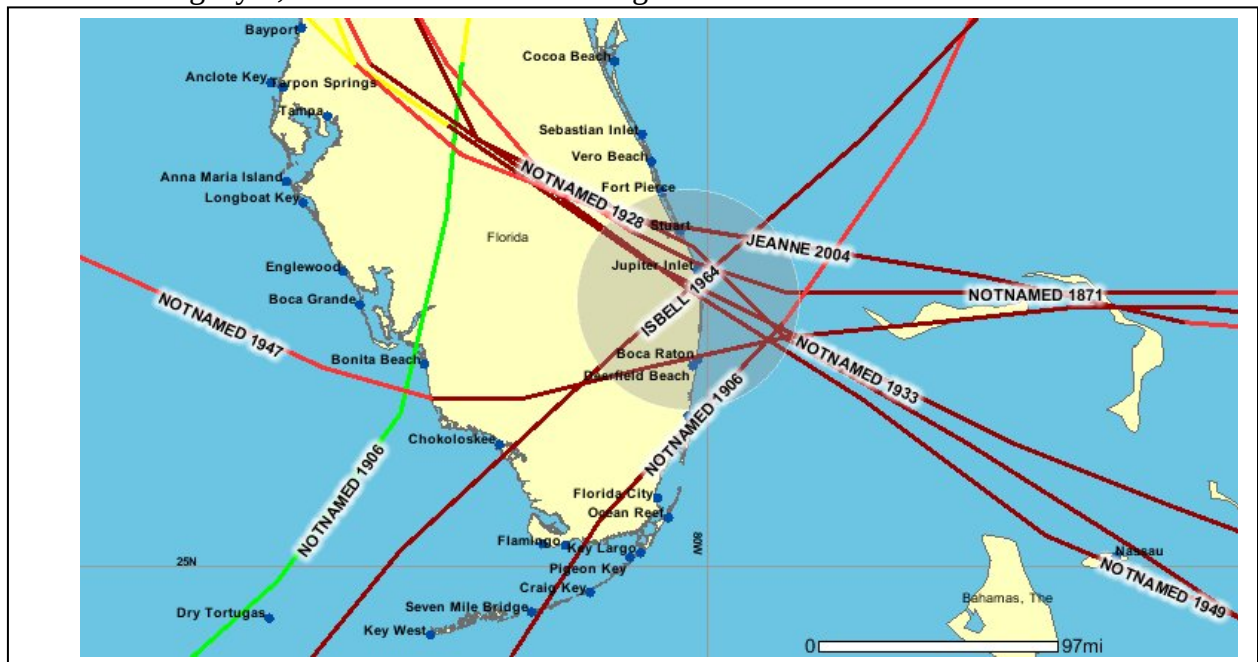
Frances & Jeanne Singer Island

The following maps, produced using the NOAA Coastal Services Center tracking tool, display the tracks of hurricanes of varying strengths and tropical storms that have passed within 50 miles of the Town of Palm Beach in the central east coast area of Palm Beach County.

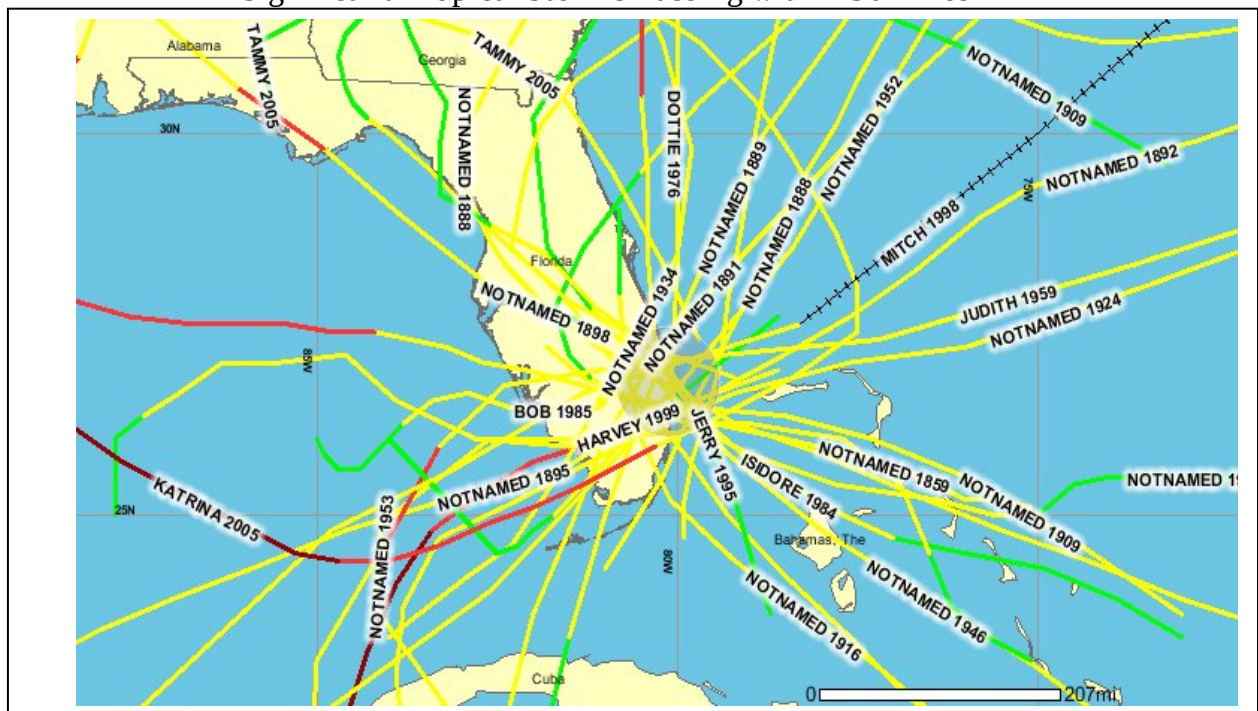
Category 1 & 2 Hurricanes Passing within 50 Miles of Palm Beach

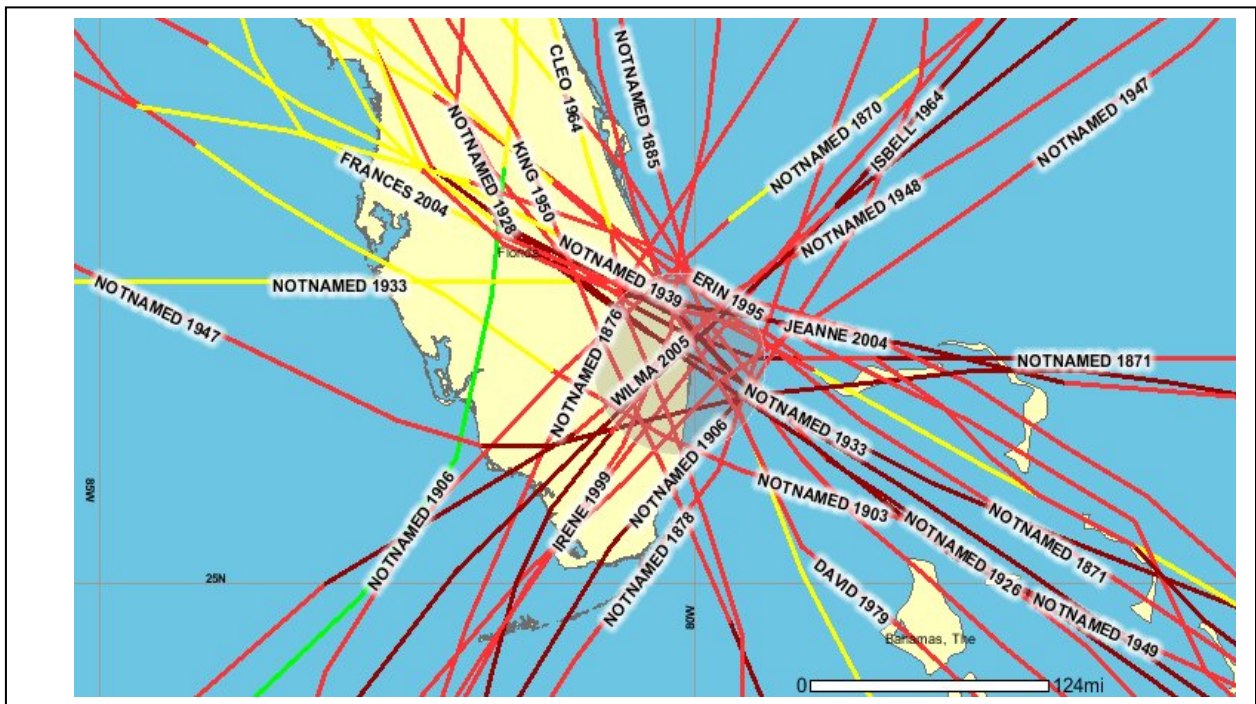


Category 3, 4 & 5 Hurricanes Passing within 50 Miles of Palm Beach



Significant Tropical Storms Passing within 50 Miles of Palm Beach





All Hurricanes Passing within 50 Miles of Palm Beach

Likelihood of Future Occurrences

Future occurrences of Category 1 to 4 hurricanes are a certainty. A Category 5 is not beyond the limits of possibility, although there has never been a recorded Category 5 in the county.

Palm Beach County has among the shortest return periods for hurricanes, averaging a hurricane or tropical storm every 6.57 years. The return period for major hurricanes is 13 years. The last hurricane with sustained Category 3 or higher winds occurred in 1949. The county has been extremely fortunate to dodge several major storms since that time.

There is evidence that hurricanes are increasing both in frequency and intensity. Whether this is simply a cyclical pattern or the result of climate change is a hotly debated issue. Regardless of the cause, the reality is we can look to an active period for years to come. And, given the tremendous growth that has occurred in coastal areas of the county since the last major hurricane, the level of destruction and costs can be expected to be higher than ever. The direst concern of the engineering community involves the potential for another 1928 storm scenario that could cause a catastrophic failure of the Herbert Hoover Dike. Such an occurrence would smash all records for destruction.

This hazard analysis has dealt exclusively with hurricanes and tropical storms. It has not addressed the many hazards that often accompany hurricanes. Readers are directed to separate hazard write-ups on the topics of storm surge, dike failure, tornadoes, flooding, straight-line winds, and sea rise.

Vulnerability

Assessing the county's vulnerability to hurricanes is complicated by a number of facts. Because storms vary so greatly in size and intensity, virtually the entire county must be considered at risk. It is difficult, if not impossible, to consider the cumulative vulnerability of the community to hurricanes when combined with other hazards that commonly accompany them (e.g., storm surge, tornadoes, precipitation, flooding, coastal erosion, etc.). While it is possible to put numbers on the population, structures and infrastructure at risk, it is much more difficult to quantify social, economic and environmental impacts. The cascading ripple effects of escalating damages (e.g., lost services, population displacement, lost employment and revenue, and the costs for long-term recovery, reconstruction and economic redevelopment) further complicate any meaningful discussion.

In this section, discussion will be limited to quantifying the size and distribution of the population at risk and the number, type and value of structures at risk, by jurisdiction, from the impacts of maximum strength hurricanes of varying size. A more detailed profile of the social, built and natural assets at risk can be found in the Hazard Environment appendix to the Local Mitigation Strategy plan.

Population at Risk

The population of Palm Beach County is approaching 1.3 million people. Approximately 88% of the population currently lives within 10 miles of the coast. The table below provides a brief descriptive profile of the population by jurisdiction. More information on the population at risk is contained in the Hazard Environment Annex to the Local Mitigation Strategy Plan.

Palm Beach County Population Distribution by Jurisdiction

Jurisdiction	Population 2007	Population Density (Pop/Sq Mile)	Projected Population 2012	Median Age	Median Household Income	Housing Units
Atlantis	2,125	1,505.3	2,218	60.9	\$87,554	1,210
Belle Glade	16,196	3,476.8	2,218	29.3	\$26,543	5,846
Boca Raton	82,224	2,948.3	87,551	43.7	\$73,951	41,377
Boynton Beach	67,606	4,210.9	72,869	42.8	\$47,481	34,484
Briny Breezes	492	6,434.2	557	57.5	\$79,802	545
Cloud Lake	171	2,716.4	174	34.3	\$54,718	68
Delray Beach	67,342	4,237.2	72,667	44.2	\$52,929	35,790
Glen Ridge	283	1,252.5	288	34.3	\$54,718	106
Golf	263	311.5	287	58.0	\$100,822	160
Greenacres	30,133	6,452.9	32,021	40.4	\$43,941	15,402
Gulf Stream	766	921.6	803	51.5	\$65,278	575
Haverhill	1,565	2,727.5	1,645	31.1	\$48,092	608
Highland Beach	4,110	6,967.3	4,359	62.0	\$89,207	3,983
Hypoluxo	2,679	4,151.9	3,158	45.7	\$55,942	1,823
Juno Beach	3,551	2,540.4	3,761	54.4	\$69,266	2,635

Jurisdiction	Population 2007	Population Density (Pop/Sq Mile)	Projected Population 2012	Median Age	Median Household Income	Housing Units
Jupiter	47,562	2,280.9	52,387	41.8	\$68,384	25,394
Jupiter Inlet Colony	467	2,343.5	540	57.8	\$68,114	344
Lake Clarke Shores	3,606	3,425.5	3,721	43.0	\$68,568	1,518
Lake Park	9,125	4,201.4	9,422	35.2	\$39,580	3,838
Lake Worth	37,403	6,631.7	39,068	34.9	\$36,059	16,807
Lantana	10,012	4,351.4	10,429	38.2	\$42,990	4,691
Loxahatchee Groves	3,122	260.0	3,335	35.0	\$58,660	
Manalapan	364	851.2	394	49.5	\$145,385	262
Mangonia Park	2,412	3,401.9	3,225	35.6	\$42,958	1,007
North Palm Beach	13,120	3,523.8	13,897	47.7	\$63,984	7,930
Ocean Ridge	1,924	2,054.0	2,132	57.5	\$91,589	1,819
Pahokee	6,637	1,230.2	7,110	25.9	\$27,787	2,131
Palm Beach	10,948	2,738.0	11,316	60.9	\$111,550	10,365
Palm Beach Gardens	43,467	777.1	49,213	44.4	\$71,671	21,970
Palm Beach Shores	1,314	5,710.5	1,360	50.0	\$51,021	1,166
Palm Springs	12,321	7,428.9	12,785	38.2	\$41,789	6,223
Riviera Beach	34,331	4,095.8	37,401	36.9	\$40,955	16,281
Royal Palm Beach	29,630	2,942.4	35,262	38.2	\$67,897	11,124
South Bay	4,093	1,103.1	4,263	31.6	\$29,652	1,000
Tequesta	5,673	2,595.9	6,034	46.6	\$70,288	2,921
Wellington	46,198	1,472.9	51,326	38.5	\$86,929	18,076
West Palm Beach	95,617	1,684.5	104,716	37.5	\$46,217	47,388
Total Incorporated	773,241					381,244

Residential Units at Risk by Jurisdiction

Nearly 77 percent of the county's single family residential units are single story structures, 17 percent are multi-story, and 6.2 percent are manufactured homes. The residential housing stock is well distributed throughout the eastern county. Forty seven percent of residential units reside in the unincorporated areas of the county. The seven municipalities of West Palm Beach, Boca Raton, Boynton Beach, Palm Beach Gardens, Jupiter, Wellington and Delray Beach collectively have about 35% of the county's residential units. The southern municipalities of Boca Raton, Delray Beach and Boynton Beach collectively have an estimated 46,348 residential units; the northern municipalities of Palm Beach Gardens and Jupiter have 25,622 units; West Palm Beach in central Palm Beach County has 20,377 units; and the communities of Wellington and Royal Palm Beach have 24,696 units. The western communities of Belle Glade, Pahokee and South Bay have approximately 4,850 total residential units.

The overwhelming majority of residential structures (79%) are of CB Stucco construction. Thirteen and a half percent have exterior walls of wood in the form of wood siding, wood frame stucco or board batten. The balance is constructed of a variety of other materials. A more detailed breakdown by age, type of construction, and type of residential housing are contained in the Hazard Environment Appendix to the Local Mitigation Strategy Plan.

Non-Residential Building Stock at Risk

The table below provides a breakdown of commercial, industrial, government, educational, healthcare, religious and other non-residential structures by jurisdiction. Eighty one percent were built since 1960, but 82% predate current building codes. About 93% of non-residential structures reside within 10 miles of the coast. The following table shows a breakdown of the number of non-residential facilities by type, by jurisdiction.

Non-residential Facilities by Type By Jurisdiction

Jurisdiction	Commercial	Industrial	Government	Education	Healthcare	Other
Unincorporated County	3,142	2,245	413	-	-	-
Atlantis	22	7	-	-	-	7
Belle Glade	378	194	86	-	-	33
Boca Raton	1,170	427	130	-	-	257
Boynton Beach	630	343	80	-	8	14 6
Briny Breezes	-	6	-	-	3	9
Cloud Lake	3	1	-	-	-	-
Delray Beach	1,112	400	126	94	2	144
Glen Ridge	6	-	-	-	7	-
Greenacres City	154	43	15	38	-	54
Gulf Stream	-	9	9	-	-	4
Haverhill	23	1	11	-	3	2
Highland Beach	5	3	1	-	-	10
Hypoluxo	42	16	-	-	-	8
Juno Beach	53	21	1	-	-	15
Jupiter	446	323	36	63	-	139
Jupiter Inlet Colony	1	-	-	-	-	1
Lake Clarke Shores	24	-	6	-	-	1
Lake Park	239	145	22	8		13
Lake Worth	684	301	85	38	1	37
Lantana	200	94	13	13	8	15
Loxahatchee Groves	11	25	5	3	3	66
Manalapan	6	1				
Mangonia Park	48	130	5	2	2	7
Ocean Ridge	3	5			7	9
Pahokee	103	61	40	45	-	14
Palm Beach	247	26	18	9	-	30
Palm Beach Gardens	362	130	49	55	3	109
Palm Beach Shores	18	2	-	-	-	5
Riviera Beach	501	516	72	76	-	70
South Bay	61	51	14	14	-	7
Tequesta Village	97	17	15	-	-	11
South Palm Beach	1	-	-	-	-	1
Golf Village	9	7	-	-	-	4
North Palm Beach	173	14	41	7	-	27
Palm Springs	214	34	43	50	1	20
Royal Palm Beach	255	83	18	13	-	54
Wellington	159	107	18	37	3	601
West Palm Beach	1,889	971	224	169	32	216

Jurisdiction	Commercial	Industrial	Government	Education	Healthcare	Other
Countywide	12,491	6,759	1,596	1,443	64	2,146

Value of Residential & Commercial Property at Risk

An estimated total of 390,000 residential and commercial properties valued at \$128.7 billion are potentially at risk from a countywide hurricane. This includes 148,000 residential properties valued at \$28.4 billion and 7,700 commercial properties valued at \$7.7 billion. About 13 percent of county residential and commercial properties are located within the defined hurricane evacuation zone. According to calculations prepared for the Hazard Environment Appendix to the LMS Plan, the total value of residential and commercial properties, including contents, is nearly \$260 billion. Approximately 28 percent of the property value at risk resides within the hurricane evacuation zone.

The table below shows a breakdown of the value of residential and commercial properties (not including contents) by jurisdiction.

Value of Residential & Commercial Properties at Risk by Jurisdiction				
Jurisdiction	Commercial Property	Assessed Value	Residential Property	Assessed Value
Atlantis	34	\$150,943,621.00	979	\$275,444,538.00
Belle Glade	616	\$103,977,172.00	2,705	\$203,447,474.00
Boca Raton	1,393	\$5,671,436,173.00	22,863	\$9,516,856,766.00
Boynton Beach	1208	\$1,423,276,457.00	18,193	\$2,767,069,123.00
Briny Breezes	0	\$0.00	0	\$0.00
Cloud Lake	6	\$0.00	48	\$6,456,750.00
Delray Beach	1,500	\$1,874,938,546.00	15,342	\$4,444,042,833.00
Glen Ridge	9	\$2,795,600.00	80	\$14,647,276.00
Golf	51	\$33,473,729.00	151	\$105,577,856.00
Greenacres	226	\$344,218,761.00	8,811	\$1,160,134,817.00
Gulf Stream	21	\$15,387,576.00	309	\$594,599,350.00
Haverhill	24	\$15,950,001.00	559	\$73,573,964.00
Highland Beach	11	\$16,600,000.00	380	\$594,436,112.00
Hypoluxo	27	\$16,353,234.00	630	\$149,967,628.00
Juno Beach	66	\$183,873,234.00	704	\$274,128,356.00
Jupiter	823	\$1,165,784,244.00	17,663	\$5,196,069,630.00
Jupiter Inlet Colony	5	\$1,600,000.00	234	\$244,197,187.00
Lake Clarke Shores	29	\$20,251,504.00	1,396	\$226,804,915.00
Lake Park	364	\$274,704,120.00	1,571	\$238,020,003.00
Lake Worth	1,082	\$463,266,658.00	8,825	\$1,324,215,139.00
Lantana	209	\$194,435,170.00	2,712	\$563,200,523.00
Loxahatchee Groves	190	\$46,012,823.00	788	\$165,343,217.00
Manalapan	9	\$128,166,296.00	190	\$743,570,994.00
Mangonia Park	166	\$141,398,452.00	207	\$26,298,618.00

Jurisdiction	Commercial Property	Assessed Value	Residential Property	Assessed Value
North Palm Beach	171	\$188,831,863.00	2,770	\$965,323,627.00
Ocean Ridge	34	\$6,281,532.00	640	\$551,078,161.00
Pahokee	232	\$17,212,750.00	1,135	\$66,458,464.00
Palm Beach	292	\$1,319,404,452.00	2,411	\$8,560,048,471.00
Palm Beach Gardens	718	\$2,236,515,617.00	19,287	\$6,761,065,630.00
Palm Beach Shores	64	\$56,171,853.00	372	\$144,646,972.00
Palm Springs	279	\$215,581,145.00	4,154	\$511,098,918.00
Riviera Beach	1,172	\$927,701,537.00	9,792	\$1,646,970,987.00
Royal Palm Beach	404	\$640,945,158.00	10,597	\$1,750,980,808.00
South Bay	131	\$17,639,627.00	690	\$36,530,949.00
South Palm Beach	3	\$5,221,940.00	19	\$9,871,949.00
Tequesta	129	\$195,417,461.00	1,865	\$512,429,808.00
Wellington	935	\$1,189,231,949.00	18,439	\$5,503,587,408.00
West Palm Beach	3,143	\$3,820,247,143.00	25,104	\$5,158,812,624.00
Unincorporated	8,460	\$6,482,508,406.00	163,227	\$37,920,729,474.00

Damage Characteristics

Hurricane damage is caused primarily by two factors: high winds; and storm surge. It is 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 by wind, 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 the 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:

- They are more turbulent than winds in most other types of storms;
- They are sustained for a longer period of time (several hours) than any other type of atmospheric disturbance;
- They change slowly in direction, thus they are able to seek out the most critical angle of attack on a given structure; and
- 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 percent. This means a hurricane with sustained winds of 150 mph may 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 lbs per square foot on a flat surface, while a 190 mph wind will exert a

force of 122 lbs per square foot on that same structure. In terms of a four by eight foot sheet of plywood nailed over a window, there would be 1,280 lbs of pressure against this sheet in a 100 mph wind, and 3,904 lbs 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 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 beach front, will receive the full strength of a hurricane's wind on their upper stories. Recent studies estimate that wind speed increases by approximately 37 percent 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, door, or roof damage, wind pressure on internal surfaces becomes a critical 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 Andrew, catastrophic failure of one and two-story wood-frame buildings in residential areas was observed more than catastrophic failures in any other type of building. 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, which 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. The

TAOS model predicts the following quantities of debris for Palm Beach County given the following hurricane strengths:

Tropical Storm:	156,142 cubic yards/acre
Category 1 Hurricane:	1,049,571 cubic yards/acre
Category 2 Hurricane:	3,183,532 cubic yards/acre
Category 3 Hurricane:	7,431,401 cubic yards/acre
Category 4 Hurricane:	16,389,149 cubic yards/acre
Category 5 Hurricane:	44,874,888 cubic yards/acre

Both the Town of Palm Beach and City of West Palm Beach are old, historical communities on Palm Beach County's east coast. Their age alone makes them particularly vulnerable to hurricane damage. Both cities have old, historically significant structures whose loss would represent the loss of irreplaceable cultural resources. The age and construction type of much of the housing in West Palm Beach and to a lesser extent in many of the other coastal communities, suggests these communities would be hit very hard by a major storm.

Mitigation & Protective Measures

Palm Beach County employs a full array of mitigation strategies and measures to reduce wind risk from hurricanes. Key among these are the following:

- Ongoing public awareness and education efforts on the threats of hurricanes and tropical storms and the importance of mitigation
- Promotion of personal and business preparedness and continuity of operations planning
- Use of the best available warning systems, technologies and information sources for hurricane preparedness
- Continuous monitoring and enhancement of evacuation and sheltering capacities and plans
- Administration of strict and rigorous land use ordinances, building codes and construction practices
- Promotion and support of public and private sector pre-construction and retrofit wind mitigation projects, capitalizing on applicable federal, state and other mitigation assistance programs and guidelines
- Promotion of mitigation through public-private partnership initiatives
- Incorporation of mitigation into PDRPs and programs
- Administration of sound healthcare, safety, environmental and economic measures and programs to minimize hurricane damage and losses

Catastrophic Disaster Planning & Preparedness

Most communities concentrate their preparedness and planning activities on the most common hurricane scenarios. Planning for catastrophic events such as Hurricane Katrina has been a general weakness nationally.

Florida has begun significant efforts in the area of pre-event catastrophic disaster planning, with a special emphasis on hurricanes. Palm Beach County was among the first communities in the nation to prepare a local PDRP which focused broadly on long-

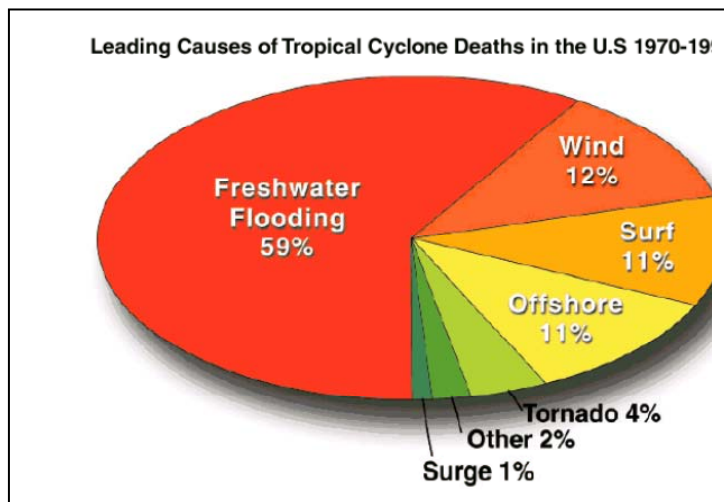
term recovery, reconstruction and economic redevelopment following a catastrophic disaster event such as a 1928 storm. This edition of the PDRP is a continuation of that planning. Mitigation is obviously a key component to pre-event and post-event catastrophic disaster planning.

Inland Flooding

Inland flooding is a temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland waters or the unusual and rapid accumulation or runoff of surface waters from any source.

In Florida, several variations of flooding occur due to the different effects of severe thunderstorms, hurricanes and tropical storms, seasonal rain and other weather-related conditions. It is a natural part of the earth's hydrologic system. Flooding can also occur if water containment structures such as dikes and dams fail.

Based on frequency, floods are the most destructive category of natural hazards in the United States. The loss of life, personal property, crops, business facilities, utilities, and transportation are major impacts of flooding. Flood waters present an additional hazard as a public health problem when they inundate drinking water facilities, chemical and waste storage facilities, waste water treatment facilities or solid waste disposal sites. Historically, floods have been a factor in over 80 percent of all Presidential-declared disasters.



Inland flooding is by far the greatest cause of deaths during and after tropical storms.

Flooding occurs in all 50 states. Florida is by far the most "at risk" state in the country in terms of flood prone properties, with over 1.8 million flood insurance policies in the state (41% of the US total), yet just 5.6% of the overall population.

Palm Beach County Flooding

As a relatively flat, low lying, heavily developed coastal county that experiences frequent intense rain events and periodic tropical storms, Palm Beach County is especially susceptible to flooding.

Palm Beach County flooding has historically taken one of the following forms:

1. Flash flooding resulting in the rapid buildup of flood waters from intense localized precipitation that exceeds drainage capacities
2. General flooding resulting from a buildup of water levels over time
3. Water body overflows resulting from excessive rainfall or water management actions
4. Coastal surge flooding driven by storm-force winds
5. Dike breaches or overtopping related to major rain and tropical storm events

The latter two forms are the subject of separate hazard analysis. This report will focus on flash, general and water body overflow flooding.

Flash Flooding

Flash flooding occurs when intense, short-term rainfall events produce a larger amount of water than can be absorbed by the surrounding soil, or in the case of urban environments, by the existing drainage and water retention systems. The usual cause of flash flooding is intense, slow moving thunderstorm activity, which is capable of dumping large amounts of water over a small area in a short time. In urban areas flooding is exacerbated by impervious surfaces that have replaced much of the natural soil and vegetative cover. Flash flooding is the predominant form of flooding in the county.

General Flooding

General flooding has a longer timescale. There is often a buildup period of days or weeks, with several separate rain events gradually saturating the soil and/or overloading drainage and retention systems, eventually triggering a flood. Such flooding may last for weeks.

Water Body Flooding

Periodic flooding of lands adjacent to catchment canals, lakes, ponds, ditches, and other storm water bodies are a natural and inevitable occurrence. When water levels in water bodies exceed containment limits they spill over onto adjacent lands within the floodplain.

Because Palm Beach County has very few natural rivers and streams, the threat of riverine flooding is quite limited in Palm Beach County. The eight mile stretch of the Loxahatchee River watershed which flows into the Jupiter Inlet experienced minor flooding damage in 1978, 1982, 1994 and 1995. These events have been more inconveniences than significant risks to life, safety and property.

Causes of Local Flooding



Significant factors contributing to inland flooding include rainfall intensity, rainfall frequency, rainfall duration, surface conditions, topography, and inadequate natural drainage.

Palm Beach County's torrential rains, low and flat terrain, and large number of inland water bodies, conspire to create a significant probability for inland flooding. An additional, increasingly significant, contributing factor is rapid water runoff associated with the vast areas of impervious surfaces created by new development, creating flood prone areas where they did not previously exist.

In urban areas grates and drains can become overtaxed or blocked with debris, leaving no space for excess water to enter drainage and sewer systems.

According to the South Florida Water Management District, "Many new residents to Palm Beach County are alarmed when they see standing water in streets or driveway swales. In other places, that could be a cause for concern, but in our region, it's something you can expect to see after a soaking summer shower."

Palm Beach County averages over 60 inches of rain a year and more than 130 rain days, with most of it coming between the months of June and November. Most developed areas are clustered along the coasts or near large waterways. Virtually flat, with most areas at or only slightly above sea level, even moderate rains can accumulate quickly.

The Water Management Challenge

Rainfall has been critical to South Florida's history, feeding its natural wetlands and refreshing surface-water and groundwater reservoirs. Its water management issues differ from those of most other areas in the country. Where most areas are concerned with protecting "scarce" water resources, South Florida's challenge is managing an overabundance of surface water. In order to drain and manage the excess water, hundreds of miles of canals, dikes, and levees have been built. Water management policies have created agricultural, tourism, and real estate industries whose success has fueled the state's population growth and taxed the seemingly abundant water supply. Now choices must be made between further population growth, environmental protection, and an adequate, safe water supply.

The area's high hydrologic variation, low physical relief, and limited storage and conveyance capacities, make water management challenging. A delicate balance must be struck, dealing with extremes: flooding versus drought and open land versus crowded urban areas. Actions range from enforcing water restrictions during dry periods to precautionary or emergency flood management during wet periods and storm events.

With annual rainfall averaging over 60 inches (but varying widely), and more than 50 percent occurring in 4 months (June to September)... with the rainy season necessitating the movement of water away from populated areas for flood control and the storage of excess water necessary to meet population needs and demands during dry periods... water management is a complex challenge.

The South Florida Water Management District (SFWMD)

The South Florida Water Management District (SFWMD) is a regional governmental agency responsible for water quality, flood control, water supply and environmental restoration in 16 counties, from Orlando to the Florida Keys. It is the oldest and largest of the state's five water management districts. The District manages and protects water resources on behalf of 7.5 million South Floridians, and is the lead agency in restoring America's Everglades – the largest environmental project in the nation's history.

Today, SFWMD's water management system includes 2,300 miles of canals and levees and more than 60 pump stations designed to protect regional water supplies and alleviate flooding. In addition to flood management responsibilities the District also addresses such issues as lake and wetland restoration, water conservation and reuse, salt-water intrusion, and water resource planning. Due to the low relief of South Florida water movement is complex with bi-directional flows in many canals aided by over 400 flow control structures. Major water control structure types include spillways, pump stations, gated culverts, and weirs.

Lake Okeechobee, and the Herbert Hoover Dike that contains it, are critical to South Florida's water supply. Given South Florida's variable weather conditions, demand on water use, and the area's vulnerability to flooding, managing lake levels is tricky business. With hydrologic modifications to the lake in the late 1800s and the building of Herbert Hoover Dike in the early 1900s, today virtually all discharges into and out of the lake are artificially controlled. A Lake Okeechobee regulation schedule has been implemented and is designed to provide floodwater storage capacity during the wet season, and to supplement water supply during the dry season, at the same time safeguarding the structural integrity of the dike.

The Florida State legislature passed the Lake Okeechobee Protection Bill during the year 2000 session. This legislation requires the South Florida Water Management District (SFWMD), the Florida Department of Agriculture and Consumer Services (FDACS), and the Florida Department of Environmental Protection (FDEP) to form a partnership to restore the lake and its watershed which has been degraded over the years by development and land use changes. The legislation is predicated on the strategies proposed in the Lake Okeechobee Action Plan.

Managing water levels, however, is a community-wide responsibility, beginning with local and secondary lakes and canals managed and maintained by Home Owner Associations, developments, local governments or water control districts. Most of these, in turn, are interconnected, and most tie into the larger, regional canal system managed by the South Florida Water Management District.

Important Flood-Related Topographical & Water Features

County Elevations

Terrain throughout the Palm Beach County is relatively level. The mean elevation is 15 feet above sea level. Ocean coastal beachfront gradually slopes up to a dune line with top elevations of 12 to 23 feet. From the dune line there is a gradual downward slope to

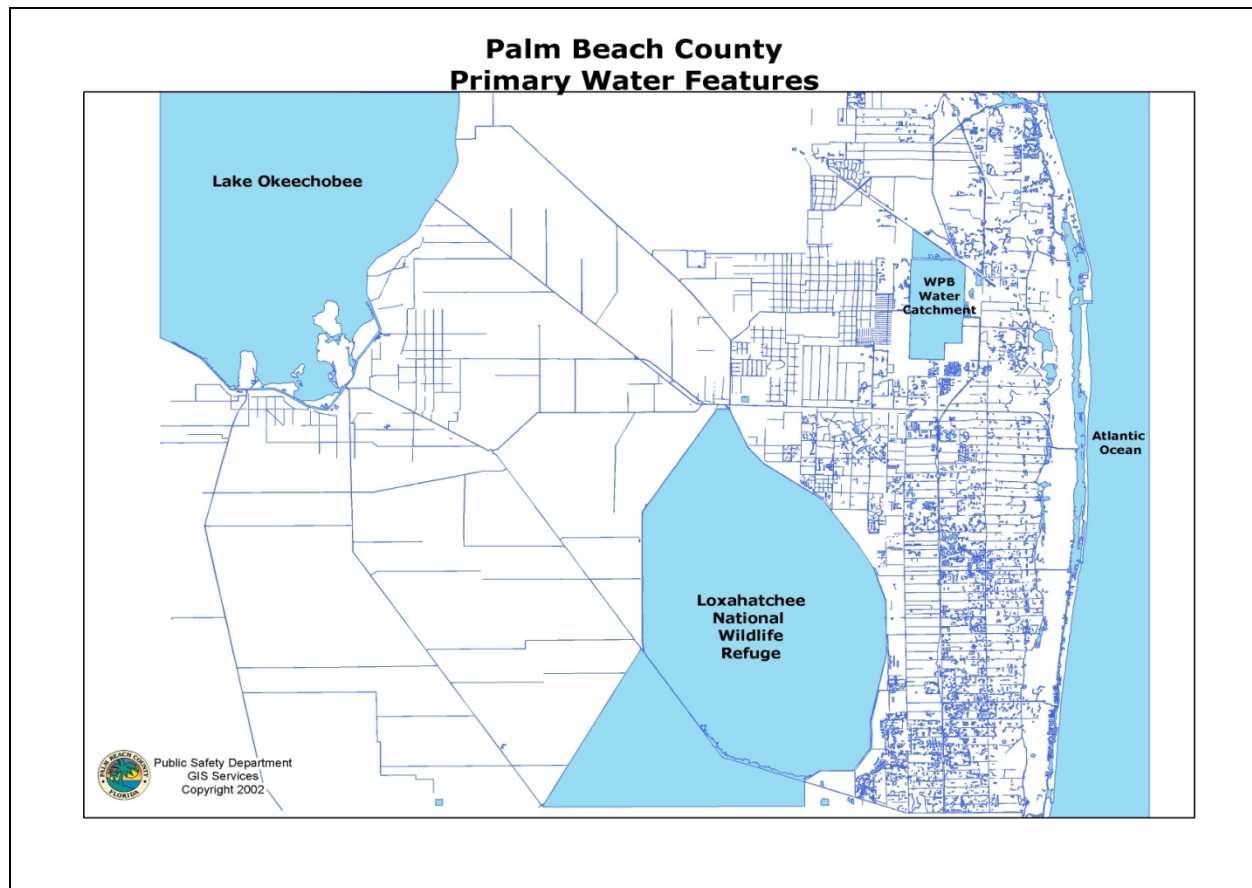
lake and inland waterway frontage with a width of from a few hundred feet to a half mile. From there, land slopes upward to a coastal ridge then downward to elevations of 5 to 12 feet in a drainage valley. Further inland, elevations remain relatively stable.

Primary Surface Water Areas

Lake Okeechobee, the largest fresh water lake after the great lakes, is South Florida's primary water reservoir. Approximately 250 square miles of the lake are within the geographical boundaries of Palm Beach County. Other sizeable bodies of water include Lake Mangonia (540 acres) and Clear Lake (401 acres) in West Palm Beach and Lake Osborne (356 acres) in southern Lake Worth and northern Lantana.

The West Palm Beach Canal connects Lake Okeechobee and Lake Worth. A vast network of canals is interconnected with the West Palm Beach Canal. A system of lakes runs north and south within 8 miles of the east coast. The Loxahatchee River system is located in the northern section of the county and is interconnected with the Loxahatchee Slough.

The map below shows the relative distribution of primary surface water areas within Palm Beach County:

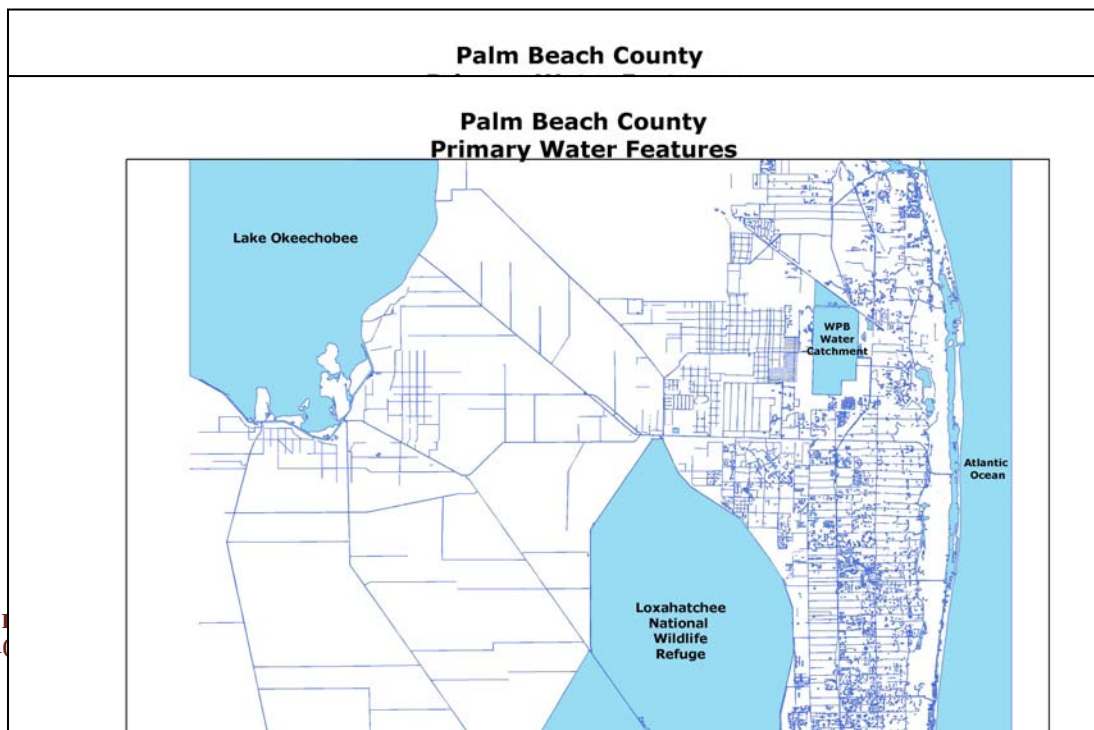


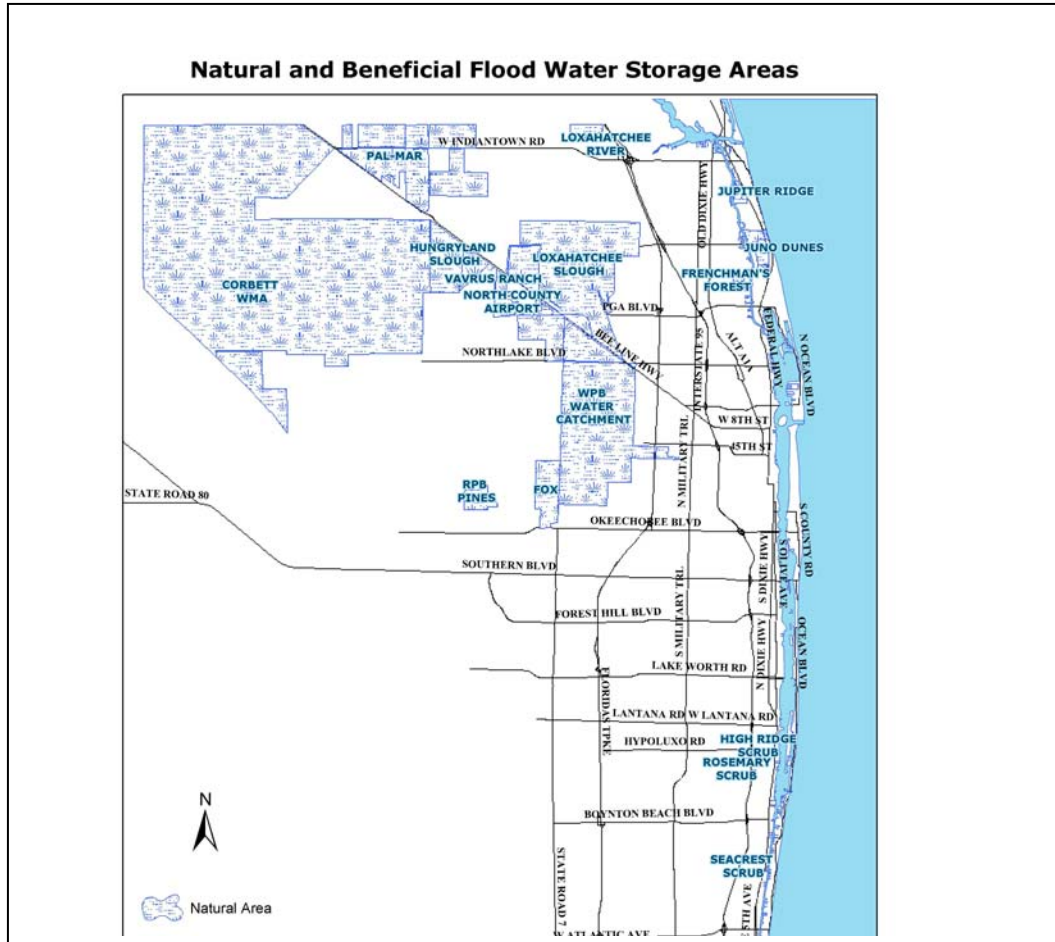
Natural & Beneficial Flood Water Storage Areas

The following areas, designated as "Environmentally Sensitive lands" are undisturbed natural areas of Palm Beach County that act as natural storage areas for flood waters, reduce the possibility of flooding nearby residences, and help to recharge the groundwater aquifer.

- Bee Line Corridor (1399 acres)
- Delray Oaks (25 acres)
- Frenchman's Forest (150 acres)
- High Ridge Scrub (40 acres)
- Juno Hills (560 acres)
- Jupiter Ridge (269 acres)
- Loxahatchee River (368 acres)
- Loxahatchee Slew (10389 acres)
- Fox Property (1538 acres)
- Pal-Mar (6944 acres)
- Rosemary Scrub (14 acres)
- Royal Palm Beach Pines (748 acres)
- Sea crest Scrub (54 acres)
- Yamato Scrub (217 acres)
- Leon M. Weekes Area (12 acres)

The map below shows these natural and beneficial flood water storage areas:



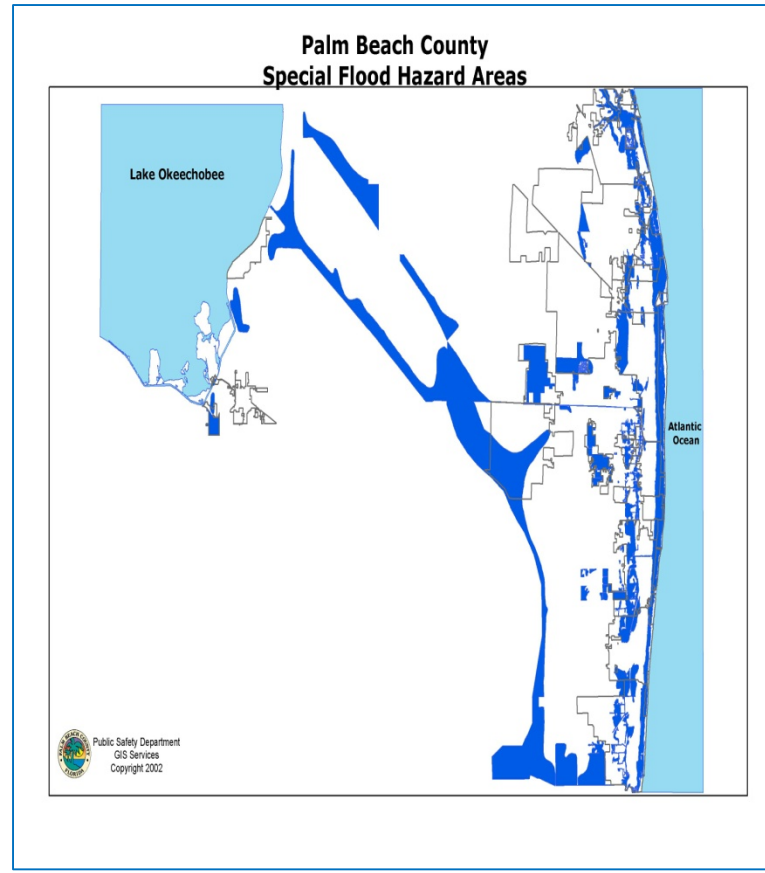


Flood Prone Areas

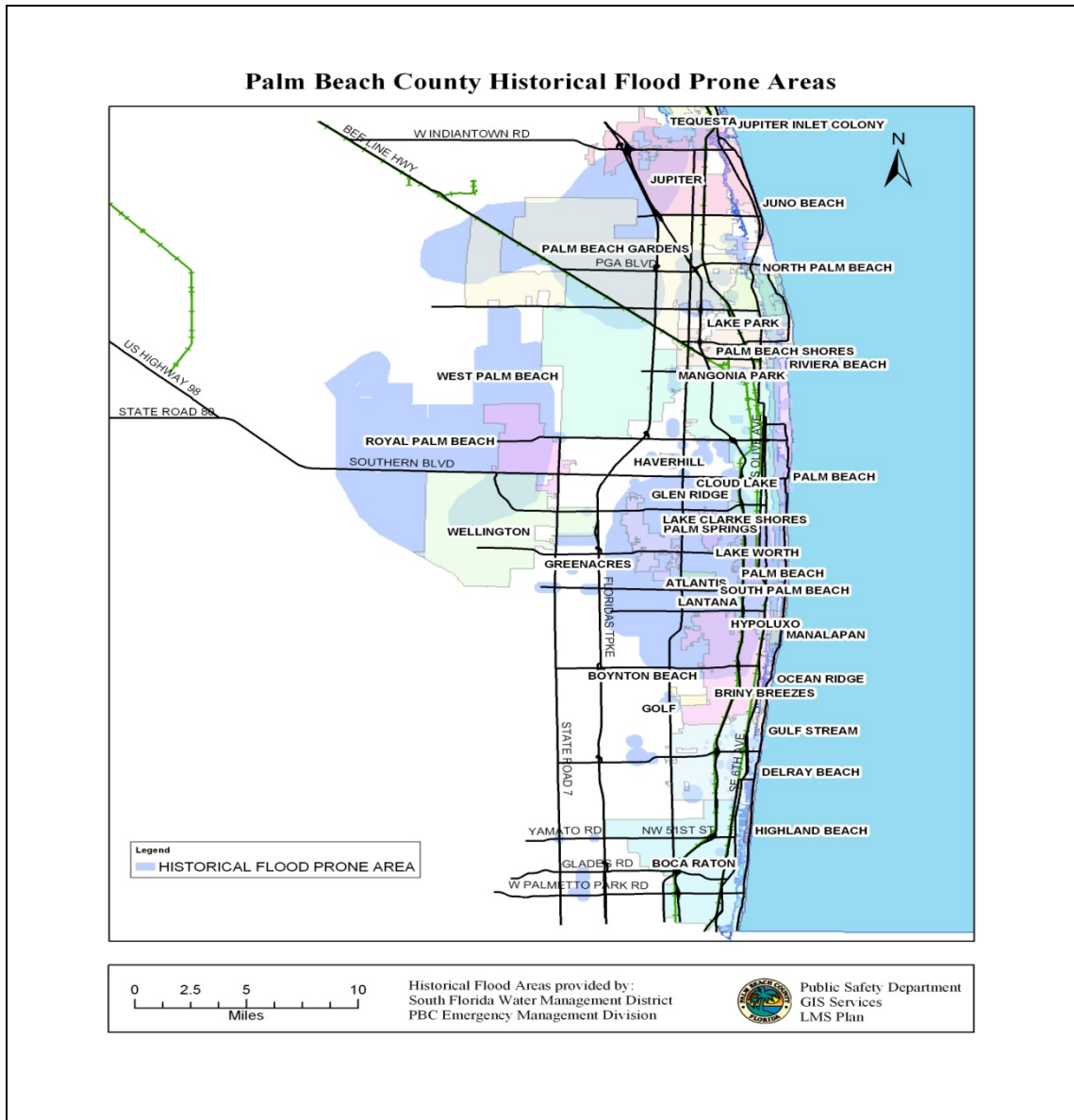
Flood prone areas are widely scattered throughout the county. Areas close to inland bodies of water and lower elevation areas in the northern and southern sections of the county are particularly susceptible to inland flooding.

The map below depicts Special Flood Hazard Areas areas within the county designated by FEMA as having a one percent chance of inundation in any given year. While some areas of the county might believe they are immune from flooding based on recent history, published elevations, and/or designations on Flood Insurance Rate Maps (FIRMS), virtually the whole county has proven to be susceptible to short term localized flooding when extraordinary rain events have exceeded the capacity of natural runoff and absorption.

A review of recent flood events suggests that Palm Beach County likely surpasses the national average of 25% of flooding occurring outside of Special Flood Hazard Areas. Even a significant number of county properties designated as "repetitive flood loss list" by the National Flood Insurance Program (NFIP) lie outside Special Flood Hazard Areas.



The following map depicts flood prone areas based on recent flood experience without regard to designated Special Flood Hazard Areas.



Historically, the Palm Beach County rainfall area has the highest annual rainfall in South Florida, followed by Broward County and Miami-Dade rainfall areas. The county's east coast communities receive higher rainfall levels than the inland and western areas. Even during drought years, there have been instances where the coastal rainfalls in eastern areas of the county were close to the average. Because there are no large impoundments in the eastern coastal rainfall areas, runoff has to be discharged into the Atlantic Ocean.

Severity

Historically, floods have been a factor in over 80 percent of all Presidential-declared disasters. The National Flood Insurance Program, established in 1968 has played a major role in helping to reduce severity through responsible floodplain management at the local level.

The State of Florida is repetitively impacted by flooding of the various types. Historically over a third of Florida FEMA declared disasters have involved a flooding component. The entire state is particularly susceptible to flooding due to its tropical weather, extensive and complex drainage systems, and the relatively low elevations.

The National Weather Service categorizes flooding severity as follows:

Major: Extensive inundation and property damage, often involving the evacuation of people and the closure of both primary and secondary roads.

Moderate: Inundation of secondary roads; possibly entering structures and vehicles; may require some evacuation.

Minor: Minimal or no property damage; ponding of poorly drained locations; possibly creating some public inconvenience.

Flash Flood Watches are issued by the National Severe Storms Forecast Center (NSSF) when there is a high probability of flash flooding. Flash flood watches are common when severe weather is expected and the water content of the atmosphere is particularly high, and when a region has hard or saturated ground from previous events. Flash flood watches are often followed by flash flood warnings. At least six hours advanced notice is provided for advisories.

The great majority of Palm Beach County's population lives and works in or near floodplains, inland water bodies and the Atlantic Coast. Life and safety risks are limited, being more associated with the pooling of flood waters than with water movement. Property damage tends to occur in isolated areas.

The life/safety risk associated with inland flooding in Palm Beach County is associated more with the pooling of water than with water movement. Because the boundaries of deeper water bodies like canals and ditches can be obscured by only a few inches street flooding, it is not uncommon for vehicles and lives to be lost to drowning. While localized, isolated structural flooding does occur in the county, a far more prevalent and costly problem involves street flooding which causes loss of access for hours or days.

Although FEMA currently lists approximately 280 repetitive flood loss properties in Palm Beach County, structural flooding damage is not generally widespread. The bigger problems associated with flash flooding are street flooding which can cause loss of function for hours to days and create dangerous driving conditions, ponding, and overflow of wastewater and septic systems that can have public health implications. It is not uncommon for motorists to unknowingly drive into canals when road boundaries are obscured by flooding. Perhaps more critical than structural damage caused by flooding are health concerns caused by post flood mold development.

The severity of a flooding event is determined by a number of local factors, including flood basin topography, precipitation patterns, recent soil moisture conditions and vegetative state.



Repetitive Loss Properties

Repetitive loss properties are defined by the National Flood Insurance Program as: “properties with two or more NFIP claims of at least \$1,000 in any rolling ten year period.” Repetitive-loss properties constitute a significant drain on the resources of the NFIP, costing about \$200,000,000 annually. Repetitive-loss properties comprise approximately 1 percent of currently insured properties but account for 25 to 30 percent of claims losses. They represent a key target of the NFIP for mitigation, including relocation, elevation and buyouts.

As of June 2009 the NFIP lists 285 repetitive flood loss properties in Palm Beach County. They are widely scattered throughout the populated eastern corridor of the county (see the map below). Because of the scale of the map, properties appear to be more closely located than they are. While there are a few geographical clusters of repetitive loss properties, most are isolated parcels. Many owners complain that their flood problems are more a matter of raised road crowns, construction of impervious surfaces like parking lots and roads, and new surrounding development built at higher elevations, than low base flood elevations per se.

The accuracy of the repetitive loss list is somewhat suspect. On the one hand it often contains properties erroneously listed as residing in Palm Beach County. At the same, it is believed that some property owners do not have insurance, or do not make claims for fear of increased insurance rates or punitive actions. There is a concern that some residents may be living in unhealthy, previously flooded, mold infested homes

Severe Repetitive Loss Properties

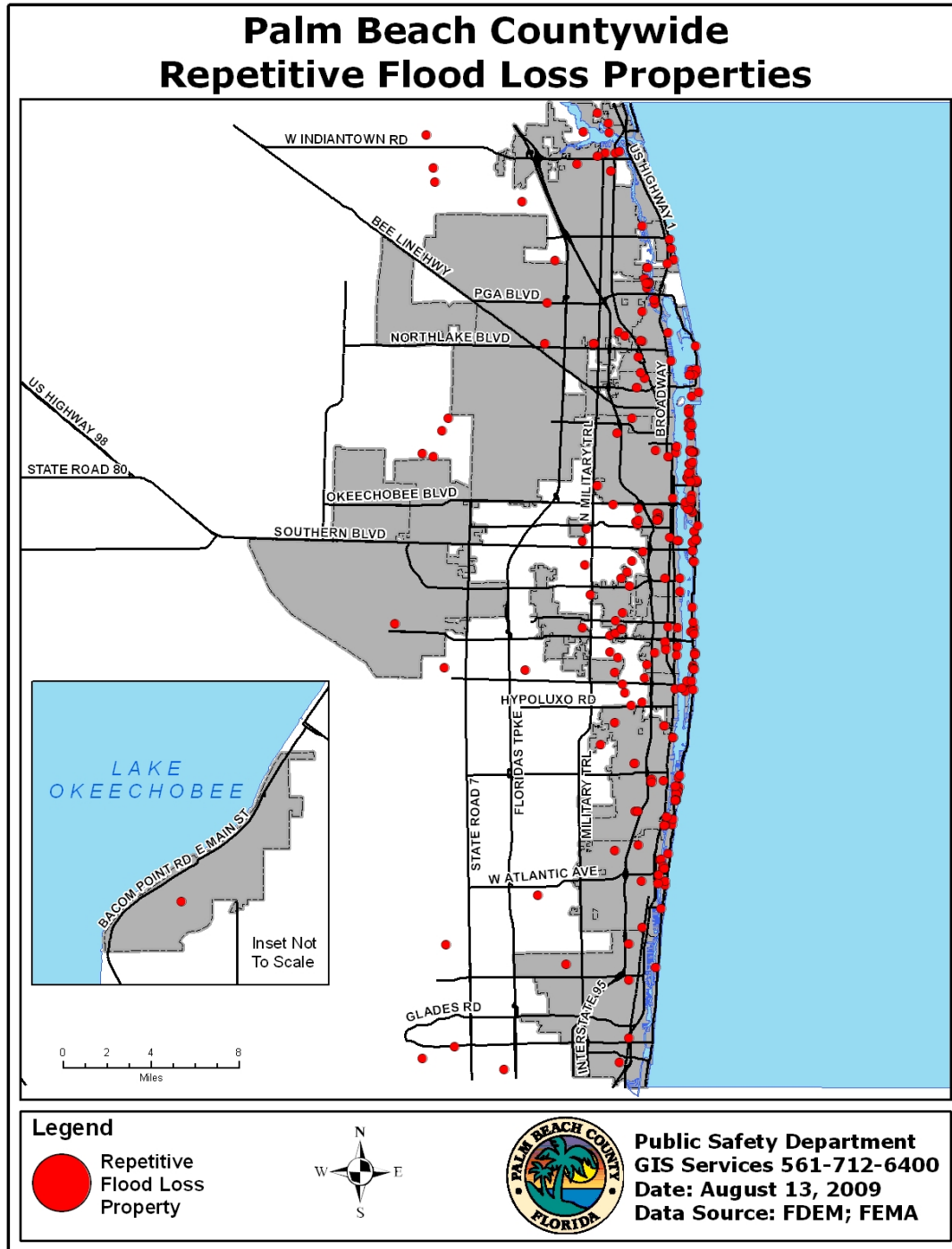
The NFIP identifies even higher risk properties as “severe repetitive loss” properties, because of the frequency and cost of flood insurance claims.

A severely repetitive loss property is defined by the NFIP as a residential property that is covered under an NFIP flood insurance policy and:

- (a) has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- (b) for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

As of June 2009 there are five Palm Beach County properties listed as severe repetitive loss properties; three in the northern part of the Town of Palm Beach; one in the southern part of the Town of Palm Beach, and one in the City of West Palm Beach.



Previous Occurrences

This section, starting on the next page, lists and describes some of the significant flooding events that have impacted Palm Beach County.

Palm Beach County Severe Flooding Events (1994 – 2012)

Location	Date	Property Damage	Crop Damage
<u>Regional</u>	09/15/1994	500K	0
<u>Eastern County</u>	12/04/1994	5.0M	0
<u>Jupiter</u>	04/26/1995	25K	0
<u>West Central Portion</u>	07/12/1998	0	0
<u>Palm Beach Gardens</u>	01/02/1999	1.9M	0
<u>Southeast Portion</u>	06/08/1999	100K	0
<u>East Portion</u>	10/15/1999	60.0M	65.0M
<u>Palm Beach Gardens</u>	10/19/1999	0	0
<u>Boynton Beach</u>	09/30/2000	0	0
<u>FLZ068</u>	11/25/2000	250K	0
<u>West Palm Beach</u>	07/23/2001	0	0
<u>Boca Raton</u>	06/05/2005	100K	0
<u>West Palm Beach</u>	12/14/2006	5K	0K
<u>Ocean Ridge</u>	01/22/2008	10K	0K
<u>Wellington</u>	03/22/2008	0K	0K
<u>Delray Beach</u>	05/24/2008	0K	0K
<u>Palm Beach Gardens</u>	03/31/2009	0K	0K
State Rd. 7 Corridor	08/26/2012	19.0M	0K
Total		86.9.9 M	65.0 M

The five wettest years recorded during the 36 year period of record each exceeded 80" of total rainfall and each occurred in the past 18 years. In 1978, five months of significantly above average rainfall, highlighted by Hurricane David, resulted in 84.78" of rainfall. Just a few years later, in 1982 and 1983, back to back years of 108.71" and 82.85", respectively, fell in the central portion of the watershed. The other two wettest years vary dependent upon the location of the data base used. While high rainfall amounts were recorded for 1966 and 1969, the more recent years of 1994 and 1995 saw 86.26" and 83.89", respectively, fall on the coastal portions of the area. It should be noted that, while flooding occurred in each of the periods identified, significant flooding can also occur in years of lesser annual totals.

Representative Photos of Local Flooding





Probability of Future Occurrences

Countywide it is highly probable that one or more areas of the county will experience flooding every year. On average a significant inland flooding event will occur every 3 to 4 years.

Flood Mitigation & Protective Measures

The Nation's strategy for reducing flood damages has evolved from a reliance almost solely on structural flood control projects to a more comprehensive approach that also emphasizes non-structural measures such as local land-use planning and zoning, building codes, and acquisition or relocation of flood prone buildings. A full range of structural and non-structural mitigation strategies and measures are used in Palm Beach County for flood reduction and management.

Flood Control

Flood control in Palm Beach County is dependent on a complex, integrated system of canals, waterways and flood control devices operated by the South Florida Water

Management District, 20 drainage districts, and thousands of privately owned canals, retention/detention lakes and ponds.

The county's drainage system is designed to handle excess surface water in three stages. The "neighborhood or tertiary drainage systems" (made up of community lakes, ponds, street and yard drainage grates or culverts, ditches and canals) flow into the "local or secondary drainage system" (made up canals, structures, pumping stations and storage areas) and then into the "primary flood control system" (consisting of South Florida Water Management District canals and natural waterways and rivers), ultimately reaching the Atlantic Ocean.

The Water Control Districts serving Palm Beach County include the following:

South Florida Water Management District	
Acme Improvement District	Pahokee Drainage District
East Beach Water Control District	Pelican Lake WCD
East Shore Water Control District	Pine Tree WCD
Gladeview Drainage District	Ritta WCD
Highland Glades Drainage District	Seminole WCD
Indian Trail Improvement District	Shawano Drainage District
Lake Worth Drainage District	South Florida Conservancy District
Loxahatchee Groves WCD	South Indian River WCD
North Palm Beach Heights WCD	South Shore Drainage District
Northern PBC Improvement District	

Drainage System Maintenance

Palm Beach County's drainage systems consist of a combination of natural drainage ways and channels, engineered channels, storm sewers and ditches, and detention/retention basins contiguous to drainage systems. These systems can easily lose their carrying capacity with debris accumulation, sedimentation buildup and/or vegetation growth, becoming ineffective for flood prevention. Extensive maintenance is necessary to ensure flood preparedness.

Responsibility for inspection and maintenance of drainage systems falls to a variety of organizations depending on the type of system involved:

- South Florida Management District and the various water control districts provide oversight for the routine inspection of the drainage systems under their purview and for debris clearance and other maintenance activities.
- Storm drain maintenance falls within the purview of the County's Road & Bridge Division, municipal public works departments, and the State Department of Transportation.

- Inspection, clearance, and maintenance of privately owned systems are the responsibility of property owners and associations.

In rare instances, environmental regulations may prohibit removing natural debris and new growth from some drainage ways.

Maintenance activities, most commonly, include ongoing monitoring, debris and sediment removal, and the correction of problem sites and damaged systems by field crews. Quite often, maintenance actions are prompted by citizen complaints and reports. Given the sheer size of the County, the vigilance of citizens is a critical element in identifying potential drainage problems. The County has ongoing programs for structural and permanent changes to channels or basins (e.g., enlargement of openings, installation of grates to catch debris, installation of hard bank protection, construction of new retention basins, etc.) to reduce flooding and maintenance problems. Coastal communities commonly undertake a variety of maintenance measures including dune and mangrove preservation, bluff stabilization, and beach nourishment to protect coastal buildings, property, and coastal water bodies from flooding and erosion.

The county and municipalities work continuously to improve and maintain their storm water management systems. Some of these projects are self funded and others depend on grant support. Drainage improvement projects are among the most prevalent flood mitigation strategies reflected on the County's Local Mitigation Strategy prioritized project list.

Regulatory Measures

Flood Damage Prevention Ordinances

Unincorporated Palm Beach County and many of the municipalities have Flood Damage Prevention Ordinances.

Floodplain Permitting

The NFIP requires participating counties and municipalities to issue permits for all development in the 100-year floodplain. Development is broadly defined by NFIP to include any man-made change to land, including grading, filling, dredging, extraction, storage, subdivision of land, as well as the construction or improvement of structures. Proposed development must not increase flooding or create a dangerous situation during flooding, especially on neighboring properties. If a structure is involved, it must be constructed to minimize damage during flooding. Permitting officials work with applicants to discourage development in the floodplain wherever possible, but when unavoidable, the effects of development must be minimized.

The permitting review process may seem cumbersome at times, but it is a requirement for continued community participation in the NFIP. Violations can not only jeopardize a community's standing in the NFIP, they can impact the ability of residents to obtain flood insurance.

Elevation of New and Substantially Improved Structures

Damage to "new" and "substantially improved" floodplain structures is minimized by elevating the lowest floor of occupied areas a specified amount above the 100-year flood elevation. Substantially improved structures are those where the cost of reconstruction, rehabilitation, addition or other improvements equals or exceeds 50% of the building's market value. Substantially improved structures are subject to the same elevation standards as new structures.

Elevation Certificates

To verify that buildings have been properly elevated, building officials require the completion of an Elevation Certificate by a professional engineer or surveyor. After the lowest floor is in place, its elevation above sea level is determined by a survey. The Elevation Certificate is part of the permit record and must be submitted before the building may be occupied.

Structural Mitigation Measures

While flood insurance can greatly reduce the cost of flood losses and rebuilding, there are six mitigation measures that can help prevent houses from flooding in the first place, even if they reside in a special flood hazard area. Particularly if a property has sustained previous flood damage or is at high risk, the following mitigation projects are recommended to homeowners as potentially good investments. Grant funds are sometimes available to assist.

Elevation Projects – Raising a house so that the lowest floor is above the flood level. This can be done by elevating the entire house, including the floor, or by leaving the house in its existing position and constructing a new elevated floor within the structure. The method used depends largely on construction type, foundation type, and flooding conditions.

Wet Floodproofing – Wet floodproofing involves modifying the uninhabited portions of a house (e.g., crawlspace or unfinished basement) so that flood waters can enter but not cause significant damage to the house or its contents. This also allows interior and exterior hydrostatic pressures to equalize, reducing the likelihood of wall failures and structural damage.

Dry Floodproofing – Dry floodproofing involves sealing a house to prevent flood waters from entering. Making the house watertight requires sealing the walls with waterproof coatings, impermeable membranes, or supplemental layers of masonry or concrete. Doors, windows, and other openings below flood levels must be equipped with permanent or removable shields, and backflow valves must be installed in sewer lines and drains.

Construction of Levees and Floodwalls – Constructing flood protection barriers around the house to help hold back flood water. Levees are typically compacted earthen structures; floodwalls are engineered structures usually built of concrete, masonry, or a combination of both.



Relocation – Moving a house to high ground outside the flood hazard area is also an option. When space permits it may be possible to relocate the house to higher ground on the same piece of property. Once relocated, utility lines are reconnected.

Demolition – Tearing down a damaged or high risk structure and either rebuilding properly somewhere on the same property or moving to property outside the regulatory floodplain.

The photos below show two examples of local flood mitigation projects: an elevation project during construction on a repetitive loss property in the Acreage, funded, in part, by an FMA grant, and a deflection flood wall project constructed on a repetitive loss property in Lake Park. They represent two extremes of mitigation... one a costly, high tech solution, and the other a simple low cost solution.



National Flood Insurance Program (NFIP)

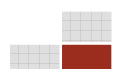
Since 1968 the Federal Emergency Management Agency (FEMA) has administered the National Flood Insurance Program (NFIP) which makes federally backed flood insurance available to residents, renters and business owners in communities that agree to adopt and enforce minimum standards for flood plain management to reduce future flood damage.

Palm Beach County and all 38 municipalities participate in the NFIP program along with 20,000 other communities across the U.S. and its territories. Community participation in the NFIP is voluntary.

Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly \$1 billion a year through communities implementing sound floodplain management requirements and property owners purchasing of flood insurance. Buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains. Mapping flood hazards creates broad-based awareness of flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

The table below profiles the breadth and scope of Palm Beach County's NFIP program and insurance activity.



Palm Beach County
National Flood Insurance Program Community Profile (2009)

JURISDICTION	CID	REGULAR ENTRY	POLICIES IN FORCE	INSURANCE IN FORCE	NO. PD LOSSES	TOTAL LOSSES PD	DAMAGE CLAIMS SINCE '78
Palm Beach County	120192	2/1/1979	78,414	\$19,940,904,900.00	1,262	\$12,167,201.78	35
City of Atlantis	120193	11/1/1978	410	\$99,632,100.00	18	\$31,637,090.00	0
City of Belle Glade	120194	5/15/1978	247	\$60,899,900.00	3	\$26,837.91	0
City of Boca Raton	120195	6/1/1978	15,810	\$4,006,213,500.00	167	\$1,050,859.46	0
City of Boynton Beach	120196	1/3/1979	10,105	\$1,837,637,300.00	215	\$957,785.03	0
Town of Briny Breezes	120197	5/15/1978	124	\$14,291,200.00	6	\$14,227.77	0
Town of Cloud Lake	120198	5/15/1978	13	\$2,967,400.00	5	\$20,317.57	0
City of Delray Beach	125102	4/9/1971	8,858	\$1,941,584,600.00	305	\$1,614,857.07	4
Town of Glen Ridge	120200	5/15/1978	28	\$7,135,900.00	4	\$8,520.00	0
Village of Golf	120201	8/26/1977	20	\$6,720,000.00	2	\$42,999.54	0
City of Greenacres	120203	8/26/1977	429	\$95,861,200.00	5	\$33,262.32	0
Town of Gulf Stream	125109	11/24/1972	358	\$108,548,500.00	17	\$74,130.15	0
Town of Haverhill	120205	8/26/1977	27	\$7,273,000.00	6	\$70,254.16	0
Town of Highland Beach	125111	10/16/1970	4,171	\$919,041,600.00	8	\$113,301.37	0
Town of Hypoluxo	120207	5/15/1978	1,094	\$215,600,100.00	5	\$13,145.43	0
Town of Juno Beach	120208	12/1/1978	1,725	\$349,636,000.00	20	\$306,718.36	0
Town of Jupiter Inle Colony	125120	9/22/1972	132	\$41,428,200.00	8	\$105,470.23	0
Town Of Jupiter	125119	9/22/1972	9,258	\$2,055,668,400.00	195	\$2,211,623.07	9
Town of Lake Clark Shores	120211	11/1/1978	276	\$78,192,000.00	9	\$27,254.62	0
Town of Lake Park	120212	9/15/1978	921	\$158,200,500.00	23	\$622,665.46	1
City of Lake Worth	120213	12/1/1978	1,846	\$406,808,100.00	94	\$475,527.97	0
Town of Lantana	120214	3/12/1971	1,213	\$241,165,000.00	71	\$905,919.85	1
Town of Manalapan	120215	10/30/1970	242	\$72,683,500.00	23	\$226,023.96	0
Town of Mangonia Park	120216	3/1/1978	52	\$17,841,500.00	12	\$465,502.44	0
Village of North Palm Beach	120217	8/15/1978	4,032	\$783,502,400.00	49	\$35,816,855.00	1
Town of Ocean Ridge	125134	4/9/1971	1,301	\$289,216,300.00	89	\$1,275,102.06	2
City of Pahokee	120219	5/15/1978	110	\$25,399,900.00	4	\$45,582.20	0
City of Palm Beach Gardens	120221	1/3/1979	3,790	\$1,071,217,000.00	161	\$1,400,648.81	0
Town of Palm Beach Shores	125137	6/25/1971	984	\$169,658,300.00	14	\$178,579.10	0
Town of Palm Beach	120220	5/15/1978	7,944	\$1,870,449,000.00	599	\$11,499,283.21	21
Village of Palm Springs	120223	3/1/1978	1,547	\$228,703,100.00	36	\$182,235.26	0
City of Riviera Beach	125142	9/22/1972	5,576	\$1,231,065,300.00	87	\$1,359,982.83	3
Village of Royal Palm Beach	120225	8/26/1977	809	\$213,498,200.00	10	\$144,327.96	0
City Of South Bay	120226	8/26/1977	45	\$9,150,100.00	0	\$0.00	0
Town of South Palm Beach	120227	5/15/1978	1,553	\$268,968,000.00	30	\$1,341,736.26	2
Village of Tequesta	120228	6/11/1971	1,243	\$304,601,200.00	31	\$261,270.90	0
Village of Wellington	125157	1/3/2001	367	\$118,382,900.00	3	\$11,123.39	0
City of West Palm Beach	120229	3/1/1979	7,461	\$1,688,074,200.00	261	\$3,338,620.78	16
FIP Countywide Totals			36,762	\$8,271,885,900.00	1,374	\$56,855,347.76	45

Community Rating System (CRS)

In 1991, the NFIP implemented the Community Rating System (CRS) for encouraging and recognizing community flood plain management activities that “exceed” the minimum standards required to participate in NFIP. Today more than 1000 communities across the nation participate in CRS, including Palm Beach County and several of its municipalities.

As an incentive and reward for participation, the flood insurance rates of residents in CRS communities may be reduced by up to 45% to reflect the reduced flood risk resulting from activities that meet CRS’s three goals of: reducing flood losses, facilitating accurate insurance ratings, and promoting the awareness of flood insurance.

Communities can earn points in as many as 18 different creditable activity areas grouped into four areas of emphasis: promoting public awareness, reduction of flood damage, improved mapping and regulations; and enhanced flood preparedness.

The 18 primary activity areas include:

Elevation Certificates	Land Development Criteria
Map Information Service	Flood Data Maintenance
Outreach Projects	Stormwater Management
Hazard Disclosure	Floodplain Management Planning
Flood Protection Information	Acquisition & Relocation
Flood Protection Assistance	Flood Protection
Additional Flood Data	Drainage System Maintenance
Open Space Preservation	Flood Warning System
Higher Regulatory Standards	Levee/Dam Safe

Based on the number of points earned, each CRS community is ranked in one of 10 classes (with Class 1 requiring the most points). In turn, a community’s class rating determines the amount of flood premium reduction its residents are eligible to receive. Communities are encouraged to improve their class ratings. Property owners residing within a Special Flood Hazard Area (an area subject to the one percent chance a year) may qualify for anywhere between a 5% and 45% discount. Property owners outside the Special Flood Hazard Area qualify for a standard discount of 5%.

At this writing, 25 municipalities and the County participate in the CRS. The collective activities of these communities produces nearly \$6 million per year in insurance savings for residents on the 165,800 policies in force countywide. In addition, the mitigation activities associated with the CRS reduce flood risks on a variety of fronts.

Reduced flood insurance rates are only one of the benefits the community receives from participating in the CRS. There are several other benefits. First, the CRS floodplain management activities provide enhanced public safety, a reduction in damage to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, and protection of the environment. Second, the community can evaluate the effectiveness of its flood program against a nationally recognized benchmark. Third, technical assistance in designing and implementing some activities is available at no charge. Fourth, the flood program benefits from having an added incentive to maintain its flood programs over the years. CRS status could be

affected by the elimination of a flood-related activity or the weakening of the regulatory requirements for new development. A similar system used in fire insurance rating has had a strong impact on the level of support given fire protection programs. Fifth, implementing some CRS activities, such as floodplain management planning, can help the community qualify for certain Federal assistance programs.

Palm Beach County Among Top Floodplain Management Programs in U.S.

In October 2011, Palm Beach County was awarded a CRS Class 5 rating from FEMA/Insurance Services Office, which places it among the top floodplain management programs in the country. Only a handful of communities achieve a Class 5 rating. As a result of the rating change, residents of unincorporated Palm Beach County will enjoy a 25% deduction in the flood insurance premiums. Countywide CRS saves residents about \$6 million per year in insurance premiums.

Palm Beach County has accomplished some firsts in CRS. It was the first community in the nation to develop a comprehensive flood awareness website. The site represents a one stop information source for residents on flood matters. It is referenced as a model by FEMA and the Insurance Services Office (ISO) in their educational programs.

Another first was the establishment of a “CRS Users Group” which meets monthly to discuss and share information, ideas and experience on each of the 18 activity areas. The group, comprised of the CRS Coordinators of 23 CRS communities meets monthly. A key purpose of the group is helping each other to enhance their programs and raise their class ratings. ISO representatives and executives have visited group meetings and encourage communities nationwide to form similar groups.

The CRS also pursues collaborative outreach projects to heighten public awareness of flood threats and protective measures. In addition to posting flood safety information in the county’s four telephone directories, incorporating flood information in public presentations, etc., the CRS organizes and conducts an annual Flood & Hurricane Awareness Expo which is attended by 10’s of thousands of residents. The expo features dozens of public and private sector exhibitors and non-profit organizations and interactive activities for attendees. Informational materials are handed out and questions are answered on the spot.

More information on the CRS can be found in the County’s Local Mitigation Strategy Plan or obtained from the CRS Coordinator or CRS Users Group.

Flood Mitigation Assistance Program (FMA)

The Flood Mitigation Assistance (FMA) Program is a National Flood Insurance Program (NFIP) initiative administered by the Florida Department of Community Affairs to help communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures insurable under the National Flood Insurance Program.

Presently Palm Beach County offers the program on a limited basis to owners of “repetitive flood loss” properties based on the availability of Federal and State funds and the availability of local resources to administer the program. The program provides homeowners with reasonable, cost-effective hazard mitigation options and potential public and private financing alternatives. The Federal Emergency Management Agency

contributes up to 75% of eligible mitigation costs. The remaining 25% must come from non-federal sources. The homeowner must contribute at least 12.5%.

Hazard Mitigation Grant Program (HMGP)

Another federal mitigation assistance program widely used by Palm Beach County after three hurricanes and a tropical storm has been the Hazard Mitigation Grant Program. This post disaster program allows eligible applicants to apply for mitigation assistance funds based on losses suffered by the community. Flood mitigation, particularly drainage improvement projects, has been a major focus of the program. At this writing, the County had over 60 projects in various stages of review and execution through the HMGP program.

Flood Mitigation Technical Advisory Committee

Palm Beach County has established an ad hoc committee of public and private sector flood experts to develop comprehensive flood mitigation strategies and projects without regard to jurisdictional boundaries. The committee focuses heavily on the county's primary flood basins. Members of the Advisory Committee include the County's Water Resource Manager, representatives from South Florida Water Management District and the water control districts, regional engineering firms, government and municipal officials, and citizens. The Committee has developed, planned and prioritized over a dozen major projects to date.

Local Mitigation Strategy (LMS)

The Local Mitigation Strategy (LMS) is a unified, coordinated effort among County and municipal governments to reduce the county's vulnerability to the impacts of identified natural and man-made hazards. Among its primary missions, the Strategy serves as a basis for comprehensive mitigation planning, project identification and prioritization, and provides assistance to project sponsors in securing and allocating available federal, state, local and other disaster mitigation assistance funds. LMS projects cover a range of topics including flood mitigation projects. At any particular time, the LMS has 150 to 200 community mitigation projects on its Prioritized Project List.

Vulnerability

While damages caused by storm surge and dike failure can be extensive and costly, historically physical damages from inland structural flooding have been relatively minor and isolated. As a predominantly localized event, inland flooding does not pose a significant threat to the ability of the county, municipalities and businesses to carry on normal operations.

People, structures, and infrastructure located within floodplains and areas with poor drainage are most susceptible to inland flooding, particularly to flash flooding. However, flash flooding can and does affect all areas of the county. Continued development will certainly contribute to an increased frequency of runoff flooding.

For the most part, flooding depths are not sufficient to inundate large residential and commercial areas. Developed parcels tend to be elevated to a level that limits significant structural water intrusion from water build-up. Where water does intrude structures,

damage can be costly for individual property owners. Beyond physical water damage, perhaps the greater issue is the potential for mold infestation, which can create health problems for occupants and lead to costly cleanup and repairs.

Flooding can cause damage to cars and outdoor equipment, contaminate water systems, and interrupt water treatment. Sewage overflow raises health concerns.

Significant expanses of street flooding are common, can be costly in terms of access and loss of function for extended periods of time, and can create dangerous, even potentially deadly, driving conditions when road boundaries become indistinguishable.

Post storm accidents, especially electrocutions, are not uncommon, when people wander into flood waters where live wires or generators are present.

Overall, the threat of rain-induced inland flooding to lives and property is considered to be minimal to moderate. The threat from a dike failure or major storm surge event is another matter.

When flood waters do get into homes and businesses, damage costs quickly mount. According to NFIP data, the average cost of repair and cleanup by water depth in 2010 for a 2,000 square foot area was as follows: 6" - \$38,150; 1' - \$52,220; 2' - \$62,880; 3' - \$68,100; 4' - \$74,580.

Concluding Comments

Drainage improvement and increasing water retention capacities are key mitigation strategies for reducing and managing inland flash flooding of the type common to Palm Beach County. Indeed, these strategies have been reflected in number of recent mitigation projects undertaken with local capital improvement funds and the number of applications for post disaster assistance funding under the Hazard Mitigation Grant Program. Because of cost, most projects require outside funding assistance. Unfortunately, local uses of federal assistance funding for drainage improvement have been thwarted or delayed by the long and sometimes frustrating processes of justifying and receiving grant funding. Drainage improvement projects require lengthy environmental reviews and approval benefit-cost criteria are not particularly sensitive to difficult to quantify loss of function type flooding. Several projects have been withdrawn when the cost of projects have increased during the lengthy wait process. Local budget planning is also difficult under these circumstances.

Individual structural flood mitigation projects such as elevation and wet proofing initiatives undertaken under the Flood Mitigation Assistance Program have proven to be costly and difficult to administer given local staffing and resource levels. The cost sharing and reimbursement processes have also proven to be impractical and burdensome.

Lift station problems have been among the most prevalent problems encountered during recent events. Despite the obvious public health issues involved, FEMA's policies against funding generator purchases have slowed resolution of this problem.

Until these problems are resolved, flood insurance will continue to be the mitigation option of choice.

Dike Failure

At this writing, the United States Army Corps of Engineers and FEMA were involved in projects to assess and map the potential inundation that could occur under various failure scenarios of the Herbert Hoover Dike. At the same time Palm Beach County Division of Emergency Management (DEM) continues to evaluate potential threats to life and property and to develop, test and exercise appropriate warning and evacuation procedures. Additional information is available in DEM hazard specific coordinating procedures and the Comprehensive Emergency Management Plan.

Dike failure is defined as an unintended, potentially catastrophic release or surge of impounded water through or over a dike onto adjacent lands.

Dike failures can take several forms, including: “breaches” which leave gaping openings for water to escape and flood normally protected lands; “boils” which signal under seepage and incipient structural instability; and “overtopping,” where water spills over the lowest crests of the dike system causing critical landside flooding. Any one, or a combination of these problems can lead to catastrophic flood events.

The Herbert Hoover Dike is an earthen dike system which surrounds and contains Lake Okeechobee, the second largest freshwater lake in the U.S. The lake, dike system, and related features are integral components of the Central and Southern Florida Project. They play critical roles in flood control, navigation, agricultural and municipal water supply, prevention of saltwater intrusion, recreation, and preservation of environmental resources. This system is one, if not the most, critical element to the quality of life in South Florida.

One need only reflect back to New Orleans and the secondary flooding caused by Hurricane Katrina to fully appreciate how devastating dike failures can be. Many people are not aware that the portions of the Herbert Hoover Dike (HHD) and Lake Okeechobee residing in Palm Beach County rank second only to New Orleans on the International Hurricane Research Center’s list of most vulnerable areas to Hurricanes in the U.S. mainland. A study commissioned by South Florida Water Management District (SFWMD) in 2006 concluded that the current structural condition of the HHD poses a “grave and imminent danger,” and further that the dike “...needs to be fixed now, and it needs to be fixed right.”

A number of independent assessments by prominent engineering and science organizations call into question the adequacy of the dike to withstand extreme wind and rainfall conditions. There is consensus that a catastrophic failure of the Herbert Hoover Dike would pose a significant danger to the residents, local economies and environment of Palm Beach County and South Florida.

Lake Okeechobee - Pre Dike

Lake Okeechobee is a large freshwater lake, roughly circular in shape, with a surface area of about 730 square miles. Prior to 1900, the elevation of the lake's southern rim was about 20.5 feet above sea level. Lake stages typically fluctuated about 2.5 feet per year. It is known that the lake tended to overflow its banks in moderately wet years. In extremely wet periods, lake stages as high as 23' NGVD may have occurred, but most often the lake stabilized at 21.5 to 22' NGVD feet due to overflow along the entire south shore of the lake into the Everglades.

About the Herbert Hoover Dike

The first components of the Lake Okeechobee embankment levee system were constructed in the early 1900's by local interests, covering a 46.9 mile stretch between Bacon Point and Moore Haven. Gaps existed between the Miami Canal and Clewiston. These early levees were constructed of uncompacted muck excavated from adjacent canals, with heights varying in elevation between 20.6' and 26.6' NGVD.

The containment barrier of this rudimentary earthen dike was breached by storm surges from the Great Miami Hurricane in 1926 and the 1928 Okeechobee Hurricane, killing thousands of local residents and migrant workers. After these disasters, the Florida State Legislature created the Okeechobee Flood Control District, which was authorized to cooperate with the U.S. Army Corps of Engineers (USACE) in flood control undertakings.

Federal involvement with the dike began in the 1930s. After a personal inspection of the area damaged by the two hurricanes by President Herbert Hoover, the USACE drafted a new plan which provided for the construction of major levees, floodway channels, and control gates along Lake Okeechobee's shores. A long term system was designed for the purpose of flood control, protection of surrounding agricultural lands and settlements, water conservation, prevention of saltwater intrusion, and preservation of fish and wildlife populations.

The first section of the 68-mile southern shore was completed in 1936. Containment dikes were constructed and filled with materials dredged in and around the lake. Little to no formal engineering or design was performed at the time to properly determine adequate heights to prevent overtopping or internal erosion.

During the 1950's several reports were prepared which studied impacts on Lake Okeechobee and the containment system from hurricanes, lake surges, and wave runup. The design standard was set to withstand a Category 3 hurricane crossing the lake at a prestorm lake level of 17.5' NGVD.

Following heavy precipitation and flooding from two hurricanes in 1947, the dike was again expanded in the 1960s to create the current Herbert Hoover Dike. Work begun in 1932 was completed in 1971.

In the 1960s, the crest elevation of these dikes was increased and additional embankments were constructed on the northwest and northeast shores. The current

system now encircles Lake Okeechobee almost entirely except in the vicinity of Fisheating Creek on the western shore.

The second phase of construction was performed during the 1960's utilizing similar construction techniques and materials. The original dike was raised to the outside and the remaining perimeter of the lake was enclosed resulting in its current configuration.

In order to help meet the increasing demand for water in South Florida, the decision was made in the 1970's to increase the upper limit of water levels in the lake from 15.5' to 17.5' NGVD. With this increased lake level the dike had to contain a permanent reserve of water, serving as much as a "dam" as a levee. In fact, the dike embankment was officially registered with the National Inventory of Dams in April of 2005. This requirement to serve as a dam was well beyond the design expectations of the original dike. Under continuous water pressure and storm related stresses, seepage (with the related potential for internal erosion and piping) and overtopping began to become ongoing serious concerns.

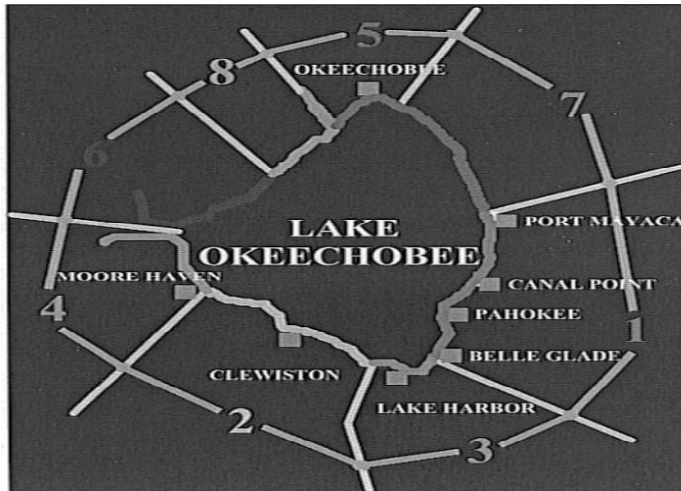
Today, the Herbert Hoover Dike consists of approximately 140 miles of earthen embankment with a crest elevation ranging from 32' to 46' NGVD. Adjacent land elevations typically range in elevation from 10 to 20 feet, with the lower elevations being found around the southern half of the lake in the vicinity of Palm Beach County. Lake elevations have varied historically between about 12.5' and 16.5' NGVD for 80% of the dike's life. Storage volume at Elevation 16.0' NGVD is approximately 4,380,000 acre-feet. Most of the annual precipitation falls in the period July to November, and the lake is historically at its lowest levels in the period June to August.

There are approximately 57 water control structures along the project's perimeter, comprised of spillway outlets, spillway inlets, primary and secondary culverts, locks, and pump stations. The U. S. Army Corps of Engineers is responsible for lake management and the operation, maintenance, repair, replacement, and rehabilitation of most of the water control structures. South Florida Water Management District owns and operates a few of the structures.

The dike is divided into 8 segments or sections referred to as "Reaches." Reaches are labeled 1 through 8 in descending order of priority in terms of priority (risk), geology, geometry, and real estate. These USACE designated reaches are depicted in the figure below. The 3 most critical in terms of potential dike failure and Palm Beach County interests are:

- Reach 1 - a 22.5 mile section including Port Mayaca, Canal Point, Pahokee and a portion of Belle Glade) comprised largely of peat on limestone
- Reach 3: a 6.6 mile section including the balance of Belle Glade and Lake Harbor critical in terms of natural flow to the lake
- Reach 2 a 20.6 mile section including Clewiston, the thinnest section

Reaches of the HDD



Beneath the embankment of the dike is a foundation of pervious layers of limestone, sand, gravel and shell providing potential paths for under-seepage and erosion. A 2006 report from an investigatory study of the dike by BCI Engineers & Scientists, Inc. declared that portions of the geologic formations under HDD and portions of the material that comprise it “bear a striking resemblance to Swiss cheese.”

During the past two decades, significant evidence of seepage and piping has been detected. Most often this has occurred when lake levels rose during the summer rainy season. In its publication *Lake Okeechobee and the Herbert Hoover Dike*, the U.S. Army Corps of Engineers concluded that engineering studies and high water events have demonstrated that the dike does not provide the required level of flood protection when lake levels exceed 18.5' NGVD. Another engineering study by United Research Services (URS) in 2006 concluded that Lake levels above 20' NGVD present the most severe threat. While levels in the 20' NGVD range are theoretically reached only once every 100 years, lake levels have, in fact, approached or exceeded 18' HGVD four (4) times since 1995. Significant distress areas have been documented at 15.3' NGVD, indicating the risk of failure in any given year is sufficient to warrant careful monitoring and mitigation planning.

The photographs below illustrate some of the problems experienced recently.



Sink Hole in Dike Embankment



Evidence of Internal Piping



Major Erosion Post Hurricane Wilma

Location, Topography and Geology

The Herbert Hoover Dike (HHD) encircles Lake Okeechobee in south central Florida. Lake Okeechobee has the distinction of being the second largest fresh water lake wholly within the United States and measures approximately 720 square miles.

Geologically, the lake is surrounded by shelly and sandy sediment. This sediment is highly porous, soft, and permeable. The lake and surrounding areas are located on the shallow aquifer, with the deeper Floridian aquifer below. This surface-level aquifer contains a thin layer of mostly fresh water, separated from the Floridian aquifer below by a bed of soil. The water in this aquifer follows the natural hydrologic gradient, flowing from the northwest to the southeast.

Regional geology in south central Florida was determined by cycles of glaciations which resulted in alternating bands of marine and freshwater deposits. From the top of ground surface downward, the geology for the southeastern portion of the lake is composed of peat, a fines horizon, a rock horizon, and sand. The peat has been identified as 5,000 years old, is often fibrous or completely decomposed, and about 8 feet thick and often overlies a usually thin seam of limestone, locally known as “cap rock.” The fines horizon contains organic silts and is typically 10-15 thick in the south but pinches out to the north. This is underlain by a rock horizon which can be 10 to 20 feet thick and is composed of limestone and sandstone. The sandstone can either be highly or poorly cemented. The limestone can vary from a dense crystalline structure to sandy or shelly, and consequently exhibits varying permeability. Often the rock horizon is inter-bedded with sand deposits. The rock horizon is underlain by sands greater than 20 feet thick which often contain shells, shell fragments, and limestone beds.

Along the southern and southeastern shorelines, the HHD was constructed directly over peat and other soft soils which had been deposited over time as the lake periodically overflowed its shore. The foundation nearly everywhere else consists principally of fine to medium-grained sands.

The dike embankment itself reflects the local geology, consisting almost entirely of coarse-grained materials with very little fines, including sand, shells, and limestone fragments ranging from gravel to cobbles randomly dispersed throughout the dike. The dike was constructed using hydraulic fill dredged from the lake bottom using a variety of methods, resulting in an exceptionally heterogeneous, pervious mixture. This method of construction did not allow for compaction of the fill or for grading of the material.

USACE has observed that due to the nature of the materials used and type of construction methods employed, the HHD contains as many as 24 features that may be contributory to problems associated with seepage and piping and ultimately structural failure.

Professional Assessments of the Threat

The following professional assessments put the threat of dike failure in context:

“The Herbert Hoover Dike poses a grave and imminent danger to the people and the environment of South Florida.” *U.S. Army Corps of Engineer's Report from National Geographic News*, 9/2/2005

“...a failure could be devastating, resulting in human suffering, loss of life, immense property damage (including residential and agricultural) and destruction of the natural habitat.” *Herbert Hoover Dike: Environmental Assessment, U.S. Army Corps of Engineers*, 4/2007

Perhaps the most radical comment was offered by P.O. Saunders in his 2007 *report Okeechobee Breach Disaster Report*, when he said “Six million South Floridians are in near term jeopardy from a breach, with the potential to kill many more people than Hurricane Katrina, the Okeechobee Flood of 1928 and the Johnstown Flood combined.

A breach could cause flooding from Palm Beach County all the way to Miami, according to the U.S. Army Corps of Engineers. *Florida Sun-Sentinel* 5/2007.

The United States Army Corps of Engineer's (USACE) *Peer Review Report*, dated January 11, 2006, indicates a significantly higher probability of failure compared to similar structures elsewhere due to the construction methods used to create the HHD and the periodic weather extremes such as drought, high water levels, and tropical weather systems passing over or near Lake Okeechobee.

There is agreement among virtually all review groups that the safe performance of the dike cannot be guaranteed with lake elevations above 17' NGVD. This represents the elevation of the lake after a 1-in-10-year storm event.

In its publication entitled *Lake Okeechobee and the Herbert Hoover Dike*, the USACE, concludes that engineering studies and the high water events have demonstrated that the dike does not provide the required level of flood protection when lake levels exceed 18.5 feet. An engineering study conducted by URS (United Research Services) in 2006 indicated Lake levels above 20 feet pose the most severe threat. While those levels are theoretically reached only once every hundred years, lake levels have approached or exceeded 18 feet four (4) times since 1995. Significant distress areas have been

documented as low as 15.3 feet (2003), indicating the risk of failure in any given year is sufficient to warrant careful planning.

It is believed that the system came very close to failure in 1995 and 1998, when lake levels peaked at 18.8 and 18.4 feet respectively. Some reaches (segments) of the embankment have been seriously damaged as a result of high lake elevations, but have since been repaired.

As USACE refurbishment of the dike continues and lake levels are successfully managed in the 13 foot range, the above statements would likely be moderated today.

Potential Causes for a Dike Failure

Among the factors contributing to the risk of a potential catastrophic failure of the Herbert Hoover Dike are:

- The dike's age (the dike is over 70 years old)
- Its design and construction (a porous earthen dike prone to seepage, piping and erosion)
- Its use (designed to be a levee, it is required to serve as a dam)
- Tropical storms and rain events (wind and water pressures on the structure)
- Limited outflow capacity (unable to keep up with inflow to the lake)
- And a variety of other natural and man-made threats (droughts, internal erosion and deterioration, construction accidents, terrorism, etc.)

As mentioned earlier, work on the current dike dates back to the 1930's. It was originally built with uncompacted earth comprised of peat, gravel, sand and shell and other materials dredged from the lake. As with all earthen levees, the use of these naturally porous materials enabled water to pass through the dike. When the threshold for upper limit lake levels was increased in the 1970's, the dike began functioning more like a dam than a levee. Exposed to constant water pressures for extended periods, seepage began conveying sediment as well as water. The resulting piping and internal erosion could affect the structural integrity of the dike. Despite rehabilitation efforts in known problem areas, it is likely weaknesses remain undetected.

Hurricane and tropical storm effects that can contribute to failure of the HHD include elevated water levels from flood run-off, wind-driven storm surges, and high waves at the downwind end of the lake that can rapidly shift from one side of the lake to the opposite side as a hurricane passes. These surge pressures or wave action can cause erosion of the dike on both lake shores and land side, elevated water pressures within the dike and, in the opinion of some, potential overtopping.

Since 1851, thirty one (31) hurricanes have impacted the area in and around Lake Okeechobee. Of these, 12 were classified as Category 3 or higher. Since the start of construction of the HHD, eleven major hurricanes have struck South Florida, passing either directly over or very near the dike. No hurricanes of category 3 or higher have hit the area since 1949. Three Category 2 storms occurred in 2004 and 2005. All three of these took their toll on the dike.

Elevated water pressures may also result from other slow-moving weather fronts that result in heavy rain within the drainage area. Because the dike was built with very limited capacity to discharge excess water, large rainfall events over the watershed can cause fairly rapid increases in water level (up to several feet in height) within the lake. A stationary weather front with significant rainfall over South and Central Florida can cause the lake to quickly fill to dangerous levels even without wind action.

The Herbert Hoover Dike is also susceptible to a number of other non-tropical factors such as:

- Rainfall over Lake Okeechobee's watershed that exceeds maximum discharge rates
- Periods of extreme drought, when the earthen dike may dry and crack, making it more susceptible to failure when post drought water levels rise
- Naturally occurring internal erosion during high water periods regardless of the weather
- Piping which occurs when soil particles are transported by the action of seeping water, creating cavities that can erode or undermine the dike
- Construction accidents, acts of terrorism, or other man-made causes

Any one or combination of these forces can cause the dike to fail. Dike failures can occur slowly or rapidly and catastrophically regardless of cause.

Previous Occurrences

Failures

In 1922 heavy rains caused the lake to rise more than four feet, overtopping the containment embankment and flooding the agricultural communities of Clewiston and Moore Haven along the lake's southern shore. Again in 1924, storms raised the lake level, causing more flooding in the same area.

It has been reported by local residents that in 1926, despite the repeated pleas of residents, the Everglades Drainage District commissioners, beholden to wealthy agricultural and commercial interests, took no action to lower elevated water levels in the lake. They wanted the lake levels high for crop irrigation and navigation. By September the lake waters exceeded 18' NGVD against the 21' high embankments. On September 18, 1926, a Category 4 storm ripped across Florida and caused the waters of Lake Okeechobee to wash over the dike near Moore Haven, killing at least 150 to 300 people.

Just two years later, before any preventive measures were taken, an even fiercer storm, the 1928 Hurricane, crossed the lake causing devastating damage and massive fatalities. When the storm hit the lake, a small dike at the south shore of the lake was breached. The resulting flood was extensive; affecting an area of hundreds of square miles. Many houses were knocked off of their foundations and broke into pieces against any obstacle that they floated into. Officially, the death toll was set at 2,500 (half of the population

who lived around the lake) although the actual number was considered by some witnesses to be much higher. The vast majority of deaths were the direct result of the flooding of Lake Okeechobee, not the winds. The 1928 storm remains the second most deadly natural disaster in U.S. history.

The area was impacted once again in 1947 by two hurricanes, which caused flooding on the south side of the lake. After the 1947 Ft. Lauderdale hurricane, the “Central and South Florida Flood Control Project” was created to build extra canals and levees. The project was managed by both the U.S. Army Corps and the newly created South Florida Water Management District. Under the auspices of the new management, the Herbert Hoover Dike was built around the full circumference of the lake. Work on the dike was finally completed in the early 1970’s.

Near Failures

In late summer and early fall of 1995 extreme rain caused Lake Okeechobee to rise to an elevation of 18.8’ NGVD, causing near-failure of the dike at nine separate areas along the south and southeast shores. The impacted areas, ranging in length from a hundred feet to over a mile, included locations near Lake Harbor, Pahokee, and Belle Glade. In 1998, the lake again rose above 18’ NGVD, with similar effects. Both of those events produced observable evidence of piping, berm collapses, excessive seepage, boils, and sinkholes in the embankment crest.

In March 2003, the South Florida Operations Office reported boils in the HDD toe ditch near South Bay. District engineers performed a detailed inspection of 84 miles of the dike from Port Mayaca to Moore Haven. During the inspection, several distressed areas were identified that were seeping turbid water, suggesting significant piping. While such distress areas could be expected to occur when the lake’s elevation is above 16.5 feet, they were actually occurring at 15.3’ NGVD.

The combined rainfall from Hurricanes Charley, Frances, and Jeanne in 2004 elevated the lake to nearly 18’ NGVD. The following year, Hurricane Wilma caused erosion of the dike near the Pahokee municipal airport. Repairs were made by USACE, but the impact of Hurricane Wilma served to further heighten concerns regarding the region’s vulnerability, prompting intervention by then Governor Jeb Bush and the launch of several long-term mitigation projects.

Likelihood of Future Occurrences

An independent Expert Review Panel Report commissioned by the South Florida Water Management District warned that there is a high likelihood of a dike failure. They suggested this likelihood is strongly correlated with the amount of water in the lake. The report notes that recent tropical storm and rain events which caused the lake levels to rise significantly took their toll on the dike in the form of seepage, piping and internal erosion.

Over the years, the U.S. Army Corps of Engineers has had to perform numerous remedial repairs on the dike. These remedial repairs were not intended to be long-term solutions. Without future interventions aimed at long-term solutions, the risk of a major

failure will continue, if not increase. The current trend of above average numbers of intense landfalling hurricanes and tropical storms is expected to continue for several more years. The time required for a long-term fix (re-evaluation, redesign, land acquisition, and reconstruction) is estimated to be more than 25 years. The prospect of a failure before long-term fixes can be put in place is a major concern.

The U.S. Army Corps of Engineers recently sought independent professional opinions and carried out their own probabilistic assessments. They concluded that without intervention, the probability of a dike failure is approximately 1 in 6 in any given year. In a June 2007 USACE report the overall odds of a breach were established at 50% within 3 years and as a virtual certainty within 5-7 years.

The Expert Review Panel believes that the number of years of service life remaining in the current dike without rehabilitation is totally dependent on the occurrence of higher lake levels. If lake levels can be maintained below 17' NGVD, there would appear to be a relatively small threat to its serviceability.

However, given the limited capacity for lowering lake levels quickly, sustained lake levels above this threshold can reasonably be anticipated within a 10-year period. Outlet capacity is simply dwarfed by the large inflows (6 to 1). No emergency spillway exists. To put the volume in perspective, each 1' increase of lake elevation roughly corresponds to 450,000 acre-feet (19.6 billion cubic feet) of water. One inch of rain falling in the Kissimee Basin can raise the lake level 3 inches. Presently, with maximum outflow, the lake can be lowered a maximum of one tenth (.1) of an inch per day.

While elevated lake levels may not be immediately catastrophic, rapid emergency intervention will be required to prevent breaches. A breach of some magnitude is considered highly probable if the lake remains at or above 20 feet for an extended length of time (approximately an 80-year occurrence). The USACE has stated that, without rehabilitation, failure of part of the dike "would" occur at certain locations with sustained lake elevations above 21.5' NGVD (calculated as a 1 in 100 year occurrence).

Severity

Inundation maps available at this writing from the U.S. Army Corps of Engineers (USACE) indicate that 38,026 PBC residents live within the area that would likely be immediately inundated by a breach of the HHD. During the harvest season, as many as 4,500 additional seasonal migrant workers take up temporary residence in the area.

There could be far-reaching effects throughout southern Florida should the Herbert Hoover Dike fail. A massive area could be inundated. Beyond the 40,000 plus residents whose houses and lives would be in immediate danger, 5 million people reside in areas south of the lake could also be at risk. Flooding could reach the Miami area and last for weeks.

In his 4,000 page document, *Okeechobee Breach Disaster Report*, P.O. Saunders describes an alarming worst case scenario where flood damages could be 10 times that of Katrina and deaths reaching 100,000.

At this writing, lake levels are currently low and the breach threat is temporarily out of the spot light. The current priority is drinking water and irrigation for agriculture. However, one wet tropical storm could potentially lead to a breach, flooding thousands of square miles around and south of the lake as far as Miami. A catastrophic breach could sever essential road, rail, power and communications to five million people for months. The local and regional physical and human toll would be unprecedented. The economic impact could be national and international in magnitude. Saunders predicts that direct losses could potentially reach \$1 Trillion dollars.

Even a partial breach could be devastating to Palm Beach County. The portion of the dike that is at greatest risk is "directed" at West Palm Beach, in the heart of the county.

Advanced warning and evacuation will be critical to saving lives. Under some conditions, less than an hour of warning might be possible.

The report from the Expert Review Panel points out that "Without Lake Okeechobee there would be no Everglades ... there would be no adjacent agriculture, no reliable drinking water supply from Palm Beach to Key West, no adequate barriers to saline intrusion of aquifers, and no control of freshwater discharge to tidal estuaries. And without the Herbert Hoover Dike, there would be no Lake Okeechobee." The panel also said "Should a failure occur, we have no doubt that the dike repairs currently proposed would be widely viewed in retrospect as having been too little, too late."

Troubled by all the dire forecasts concerning the dike, and wanting to strengthen support for a long-term solution, Governor Jeb Bush, prior to leaving office, offered some firm recommendations to the U.S.A.C.E and other agencies relating to mitigating the threat. He called for immediate federal action to shore up the dike. These recommendations are summarized in the mitigation section below.

Vulnerability Assessment

In the fall of 2006 the International Hurricane Research Center released a list of the "Top 10 Most Vulnerable US Mainland Areas to Hurricanes." Twelve criteria were used to evaluate the vulnerability of US mainland areas to hurricanes. Cyclonic energy (hurricane frequency and storm intensity) and levee/dike failure were primary determinants of vulnerability. Physical factors included storm surge and freshwater flooding potential as well as coastal erosion trends and island breaching history. Socioeconomic indicators involved populations at risk, evacuation distance and routes, what's at risk and local/state capabilities to respond to major hurricane impacts.

The final rankings were as follows:

1. New Orleans, Louisiana
2. **Lake Okeechobee**, Florida
3. Florida Keys
4. Coastal Mississippi
5. Miami/Ft. Lauderdale, Florida

6. Galveston/Houston, Texas
7. Cape Hatteras, North Carolina
8. Eastern Long Island, New York
9. Wilmington, North Carolina
10. Tampa/St. Petersburg, Florida

The results of a comprehensive risk and vulnerability assessment based on a theoretical “worst case” dike breach scenario were presented in a document entitled *Hurricane Ono Consequence Projection* published by the multi-agency Florida Catastrophic Planning Project team in June of 2007. Modeled on the 1928 Okeechobee hurricane, the study concluded that virtually the entire region south of Martin County could be impacted by a combination of surge, wind and rain effects. Total structural damage in the immediate impact area could exceed \$504 million. The lives of the entire population of 38,026 to 42,526 could be at risk. 3,972 out of 397,425 residential, governmental, business, and commercial properties, including critical facilities could be significantly damaged or destroyed. Substantial agricultural and animal issues would be encountered. Preparation, response, and evacuation would be complicated and strained by the fact that much of the local population has special needs in terms of language isolation, lack of car ownership, housing, employment status, immigration status, etc.

Additional vulnerability analysis are planned when the U.S.A.C.E. releases more detailed dike inundation data and maps.

Mitigation Strategies/ Protective Measures

Florida Catastrophic Planning Project

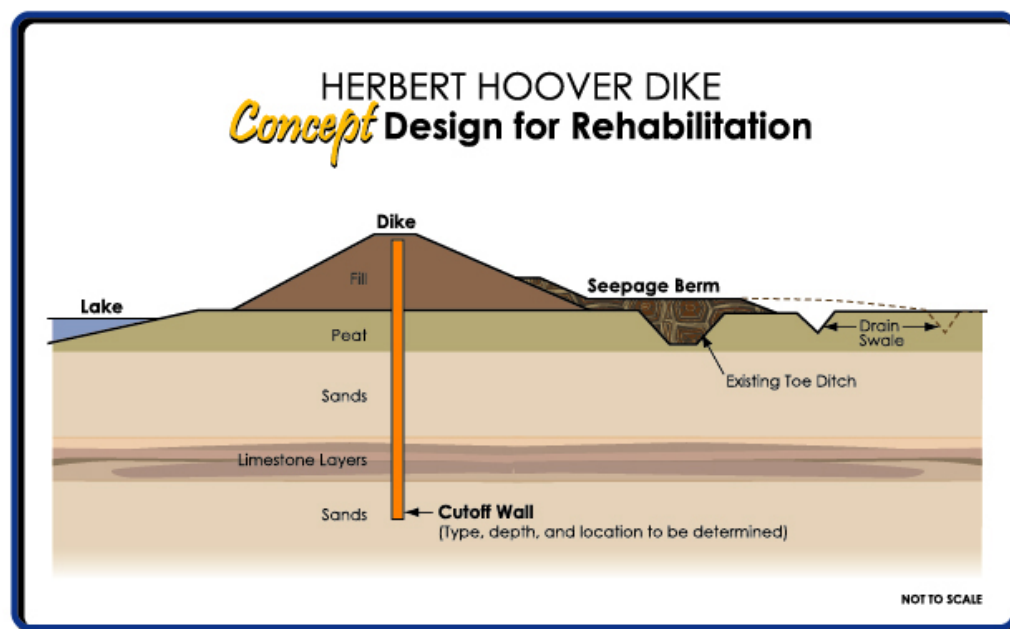
The threat of catastrophic impacts from a Category 5 hurricane making landfall in South Florida, coupled with concern over the integrity of the Herbert Hoover Dike around Lake Okeechobee, prompted FEMA and the State of Florida to begin planning for a catastrophic event that early estimates say would put most of South Florida under one to four feet of water for weeks, destroy the homes of 60 percent of the population, leave four million people without electricity, and cripple the state’s transportation infrastructure. Losses would be overwhelming. While repairs and upgrades to the dike are already underway, it is estimated the project will take at least 25 years to complete. The main products

The threat of catastrophic impacts from a Category 5 hurricane making landfall in South Florida, coupled with concern over the integrity of the Herbert Hoover Dike around Lake Okeechobee, prompted FEMA and the State of Florida to begin planning for a catastrophic event that early estimates say would put most of South Florida under one to four feet of water for weeks, destroy the homes of 60 percent of the population, leave four million people without electricity, and cripple the state’s transportation infrastructure. Losses would be overwhelming. While repairs and upgrades to the dike are already underway, it is estimated the project will take at least 25 years to complete. The main products of the Florida Catastrophic Planning project will be comprehensive Emergency Management Plan annexes and supporting plans that can be implemented in the interim.

Corps Rehabilitation Initiatives

The U.S. Army Corps of Engineers has initiated comprehensive engineering initiatives to mitigate future dike breach flooding disasters. Beginning with the most problematic areas of the

dike first; they examined several engineering alternatives to reduce the possibility of a breach in Reach 1. The preferred alternative includes the construction of an impervious cutoff wall at the crest of the dike and a stability seepage berm. The preferred alternative design is believed to offer the best technology available to reduce seepage and piping immediately at the most critical areas of the dike as well as to offer improved stability and protection in the long-term. The figure below depicts the final reach 1 configuration:



Expert Panel Mitigation Recommendations

Mitigation recommendations from the Expert Review Panel Report include:

- Reduce the probability of high lake levels by reducing the water level in the lake by two feet until effective repairs are made
- Initiate flood and hurricane evaluations as soon as possible
- Adopt dam appropriate hurricane safety criteria
- Because it is possible the dam will fail before the reparation work is completed, the Emergency Action Plan should be reviewed and updated
- Reevaluate the design of repairs to ensure the integrity of the dike during construction of the wall and trench

IHRC Mitigation Recommendations

- Lower lake levels to avoid overtopping from strong hurricanes
- Closely monitor and investigate rapid changes in water pressure on the dike due to storm surges and internal erosion

- Establish a probability model for dike failure due to storm surge and wave impacts
- Collect wave and storm surge data for future hurricanes and implement a numerical model which can predict the combined effect of storm surge and waves
- Complete analysis of digital elevation data, including Light Detection and Ranging (LIDAR) surveys

Governor's Mitigation Recommendations

Alarmed by the findings of numerous scientific investigations on the HHD in recent years, prior to leaving office, Florida Governor Jeb Bush made several recommendations to the U.S. Army Corps of Engineers:

- Adopt a regulation schedule to keep Lake Okeechobee at lower levels through the hurricane season
- Remove power poles from the toe of the dike
- Begin daily inspections of the dike to ensure potential problems are identified early
- Provide materials equipment and personnel to make emergency repairs when vulnerabilities are identified
- Accelerate repairs and rehabilitation currently underway
- Re-evaluate the design of the repairs to ensure they provide adequate protection
- Develop engineering solutions to strengthen the dike against wave action, storm surges and seepage related erosion
- Request Congressional authorization to improve Herbert Hoover Dike to dam standards
- Provide the best available data and evacuation support tools for hurricane threats to the State Division of Emergency Management

USACE Strategies and Actions for Mitigating the Risk of a Dike Breach:

- Focus repairs on the worst areas first (e.g., the toe ditch)
- Stockpile rock around the dike to facilitate emergency repairs
- Put repair plans in place
- Work with emergency management officials
- Lower lake levels via a new regulation schedule
- Beef up monitoring and inspection schedules, ensuring that anytime lake levels get to 16.5' inspections will be conducted daily by lake experienced professionals
- Closely inspect identified problem areas
- Review options to increase emergency spillway outflow capacities while carefully assessing potential downstream damage
- Support rehabilitation planning with FEMA funded LIDAR mapping data
- Construct a partial cutoff wall in the embankment



USACE Actions in Response to Governor's Recommendations

The responses from the U.S. Army Corps to all of the Governor's recommendations were conciliatory. A new design for the reinforced dike was released on October 5, 2006. As part of the new design, a berm (a shelf or raised barrier) will be built to decrease erosion and the cutoff wall will be built deeper and in the middle of the dike.

Specific responses to the Governor's recommendations were as follows:

1. *Lowering lake level in hurricane season:* Lake Okeechobee was lowered to an acceptable lake elevation for the beginning of the 2006 hurricane season. The U.S. Army Corps of Engineers will continue to use its current authority to maintain the lake elevation at safe levels going into future hurricane seasons. Further, we are in the process of studying the possibility of revising the approved lake regulation schedule to allow us to manage the lake at a lower average level year-round, to balance estuary health, a viable lake ecosystem and water supply.

2. *Removal of power poles:* The U.S. Army Corps of Engineers has already begun removal of the power poles. We will continue to coordinate with Florida Power & Light and with the South Florida Water Management District to remove and relocate power poles constructed on the dike and within the Herbert Hoover Dike right of way. We share your goal to have all power poles relocated off Herbert Hoover Dike project limits.

3. *Daily inspections:* The U.S. Army Corps of Engineers has a rigorous inspection program, the frequency of which (from once every ninety days to daily) corresponds to lake pool elevations. Potentially vulnerable areas are identified through these inspections and additional monitoring takes place, even at lower lake elevations, as necessary.

4. *Materials, equipment and personnel for emergency repairs:* Just as the Corps prepared for Hurricane Wilma and previous storms, it will continue to provide all necessary materials, equipment and personnel to ensure that any identified vulnerabilities in the Herbert Hoover Dike are quickly and effectively repaired. It has stocked supplies at various locations around the Herbert Hoover Dike, and will preposition equipment prior to predicted storms, to allow immediate access and ready availability in the event a repair is necessary. 65,000 tons of rock and stone was ordered to augment existing supplies.

5. *Acceleration of repairs and rehabilitation:* Erosion containment repairs and debris removal that were required as a result of the 2005 hurricanes were completed. The first phase of the planned Herbert Hoover Dike rehabilitation project is currently under way. The President's budget for fiscal year 2007 contained \$39.5 million to continue this rehabilitation work.

6. *Reevaluate repair design to provide adequate protection:* Repair designs will be reevaluated to ensure optimal protection is provided under congressionally-authorized levels of protection and project requirements.

7. *Engineering solutions for wave action, storm surges and seepage-related erosion:* All engineering solutions are, and will continue to be developed to optimize dike strengthening. These solutions, however, must be permitted under congressional authorizations.

8. *Request congressional authorization to improve to dam standards:* Congressional authorizations are requested by local sponsors, in this case, the South Florida Water Management District. The U.S. Army Corps of Engineers will continue to work with the South Florida Water Management District to review the need for new authorizations, and will continue

to provide assistance to them to further define those authorizations, as requested and as justified.

9. *Hurricane response data and tools to State Department of Emergency Management:* Through our proactive dam safety program, the U.S. Army Corps of Engineers consistently coordinates with state agencies responsible for emergency management preparedness and response. This includes, but is not limited to, regularly scheduled coordination meetings, training, exercise participation, and the provision of data and information, such as inundation maps, to assist county and state emergency management and dam safety personnel in the development and/or updating of emergency evacuation plans and overall preparedness. The Corps has had a formal Emergency Action Plan in place since 1994. It was updated in July 2005 in accordance with new federal dam safety guidelines.

Expert Review Panel Recommendations:

The Expert Review Panel supports USACE's program to monitor:

- Sand boils and concentrated seepage discharge locations
- Sinkholes
- Changes in seepage patterns
- Changes in embankment crest elevations and slope shapes
- Changes in any in situ instrumentation responses

Palm Beach County DEM/LMS Mitigation & Response Priorities:

- Ensure the County's Comprehensive Plan and Operating Procedures are relevant to the mitigating dike failure risks
- Integrate dike failure risk information and preparedness tips into public outreach presentations and workshops
- Ensure early warning systems are appropriate to the needs of communities at risk, in place, and fully operational
- In line with the recommendations of the Catanese Center, give serious consideration to adding a state-of-the-art acoustic warning system to the complement of notification and warning systems available in the western communities
- Be prepared to implement evacuation plans and actions relevant to dike failures
- Plan for flood safe sheltering for people at risk
- Develop response plans for no notice events
- Pre-stage resources as practicable to accelerate emergency responses
- As possible, manage the location of critical facilities in light of the dike failure threat
- Ensure that Emergency Management training programs incorporate information relevant to dike failure
- Incorporate dike failure decisions and actions into the County's PDRP and Hazard Specific Operational Plans.



Once updated flood maps and data are received from FEMA (probably in 2012), Emergency Management will update relevant plans, including the LMS plan to address:

- Population impacts
- Population notifications and public information
- Evacuation criteria and orders
- Mapping depicting flooding areas
- Critical facilities and infrastructure impact

Mitigation Benefits from the Sale of U.S. Sugar

After extensive deliberation, due diligence and public input, the South Florida Water Management District (SFWMD) Governing Board is strongly interested in accepting a proposal to acquire more than 180,000 acres of agricultural land from the United States Sugar Corporation for Everglades restoration.

The transaction would provide water managers with the unprecedented opportunity to store and treat water on a scale never before envisioned for the benefit of the River of Grass, Lake Okeechobee and the St. Lucie and Caloosahatchee rivers and estuaries. The proposed purchase is the largest public land acquisition in Florida's history and the single most important action to protect the Everglades since the designation of Everglades National Park sixty years ago.

Environmental goals of the acquisition include:

- Significant increases in the availability of water storage, significantly reducing the potential for harmful discharges from Lake Okeechobee into coastal waterways and estuaries when lake levels are high
- The ability to deliver cleaner water to the Everglades during dry times and greater water storage to protect the natural system during wet years
- Preventing tons of phosphorus from entering the Everglades every year
- Significantly reducing the need for “back-pumping” water into Lake Okeechobee from the Everglades Agricultural Area to augment regional water supply needs
- Additional water storage alternatives, relieving some pressures on the Herbert Hoover Dike while the federal government undertakes repairs
- Significant flexibility in managing Lake Okeechobee levels in a more environmentally friendly way

Following is additional informational on the dike warning system, communities at greatest risk, and a descriptive anatomy of a dike failure.

USACE Dike Failure Warning System Condition Classifications

Condition Classification	Definition
Watch Condition	A potential failure situation is developing. A dike failure may eventually occur, but preplanned actions may moderate or alleviate failure. Time is still available for further analysis/decisions to be made before failure is considered a foregone conclusion. Even if failure is inevitable, time is generally available to issue warnings and/or take preparedness actions. A warning is issued when a safety situation is observed that may lead to a failure if left unattended, recognizing that there is no immediate danger.
Non-Failure Emergency Condition	There is no danger of dike failure, but flow conditions are such that flooding is expected to occur downstream of the spillways. While the amount of flooding may be beyond the control of USACE, information of releases from the spillways will be very useful to the authorities in reaching any decisions on the need for evacuation
Evacuation Condition	Failure is imminent or has occurred. A failure either has occurred, is occurring, or is obviously about to occur. There is no time available to attempt corrective measures to prevent failure. Emergency preparedness agencies are notified that the embankment or structure is failing. Due to the short time it will take for flooding to occur, evacuation of nearby downstream areas should begin immediately.

Communities Bordering on Lake Okeechobee

Pahokee Area



Pahokee ('07)

Population	6,617
Land Area	5.39 sq. ft.
Elevation	15 ft.
Median Household Income	\$31,709
Median House Value	\$143,168

Belle Glade & South Bay Areas



Belle Glade ('07)

Population	16,624
Land Area	4.65 sq. mi.
Elevation	20 ft.
Median Household Income	\$26,945
Median House Value	\$182,654

South Bay ('07)

Population	4,506
Land Area	2.71 sq. mi.
Elevation	21 ft.
Median Household Income	\$27,945
Median House Value	\$176,207



Anatomy of a Dike Breach

Stage 1 “Initiation”

Seepage failure mode initiates due to loading event that causes development of concentrated leak or backward erosion. Initiation may occur in the embankment, in the foundation, or at the interface between the embankment and foundation.

Stage 2 “Continuation”

Seepage failure mode is not arrested due to filter, cutoff, or other intervention activity. The piping or erosion continues toward the source of water at accelerating rate due to increasing gradients and flow quantity.

Stage 3 “Progression”

Piping/erosion widens and/or deepens as flows increase due to roof formation and no other restraint to growth. Amount of flow continues to increase causing piping/erosion to grow rapidly.

Stage 4 “Breach Formation”

Seepage flow not arrested. Collapse and erosion continues until dam crest is breached due to sinkholes, crest settlement, instability of slopes, or unraveling of the downstream slope.

Stage 5 “Breach”

The Expert Review Panel believes HDD (as a system) has passed the “initiation” point on the failure continuum, and is now in the “continuation” phase. The rate of continued deterioration will be directly related to lake levels.

Sea Level Rise

Sea level rise is defined as the long-term increase in mean sea level occurring in response to global climate and local tectonic changes as measured using scientific horizontal control points and benchmarks such as The National Geodetic Vertical Datum of 1929 or NGVD 29; The North American Vertical Datum of 1988 or NAVD 88.

Implications

A third of the world’s population lives within 50 km of low-lying coasts. Even a modest sea level rise could inundate low-lying regions, accelerate coastal erosion and force the relocation of communities and infrastructures.

Societal and economic impacts of sea-level rise are evident already, and the consequences of continued rise are substantial. Beach erosion and shoreline retreat affect valuable real estate and the livelihoods of many waterfront communities. Shoreline retreat may pinch out coastal wetlands against developed areas, or the wetlands may be harmed irreversibly if the rate of sea-level rise exceeds the rate at which the biota can adapt. Rising sea level can influence the rate of salt-water incursion

into coastal aquifers, expansion of the salt-water wedge in estuaries, and the probability of damage from storm surges along coastlines.

Future increases in relative sea level promise to displace coastal populations, threaten infrastructure, intensify coastal flooding and ultimately lead to the loss of recreation areas, public space, and coastal wetlands. Coastal infrastructure will become increasingly susceptible to complications from rising sea levels as the upward trend continues. Residential and commercial structures, roads, and bridges will be more prone to flooding. Sea level rise will also reduce the effectiveness and integrity of existing seawalls and revetments, designed for historically lower water levels. Higher sea levels will result in changes in surface water and groundwater characteristics. Salt intrusion into aquifers will contaminate drinking water supplies and higher water tables will compromise wastewater treatment systems in the coastal zone. Lower elevations will become increasingly susceptible to flooding as storm surge reaches further inland due to sea level rise and the increased frequency and intensity of storms caused by climate change. And, more coastal lands will be susceptible to erosion.

Debates over the authenticity of sea rise, contributing natural and man-made causes, rates of rise, and long-term forecasts have been raging for years. It seems every week new scientific reports are released which challenge or contradict previous research. There are compelling and convincing arguments and advocates on all sides of the issue.

Dissenting voices ask whether we understand the causes of sea-level rise in the 20th century well enough to make confident projections for its course in the 21st century. The weight of evidence would seem to support the view that with or without proof of global warming, sea rise is real. Arguments over whether the changes are cyclical or heading in an irreversible direction seem to be moot in terms of the need to prepare and plan for the worst.

Global Perspective

Throughout geologic history the earth's ocean levels have risen and fallen in response to variations in astronomical configurations that impact the Earth's climatic system. Since the last Glacial Maximum (approximately 20,000 years ago), global sea level has risen by over 390 feet (120 meters), as water that was previously trapped in continental ice sheets made its way into the global ocean.

Recent measurements from tidal gauges worldwide indicate that ocean levels are currently rising at a rate of 10 to 12 inches per century (Titus & Narayanan). However, the rate of sea level rise is influenced by many factors, making it difficult to predict sea levels with any confidence over time. Global projections range from 5 to 35 inches over the next 100 years.

In its November 2007 *4th Assessment Report*, the Intergovernmental Panel on Climate Change (IPCC) indicated that sea level rose 3.3 mm per year between 1993 and 2006 (exceeding the organization's 2001 prediction). There is a growing concern that the rate may continue to accelerate in the near future.

Implications for Florida & Palm Beach County

As part of a nationwide program initiated by the Environmental Protection Agency to evaluate global climate change, in 2005 the Treasure Coast Regional Planning Council published a report entitled *Sea Level Rise in the Treasure Coast Region*. The study emphasized that because of its expansive coastline, low elevations and flat topography, economic dependence of the tourism industry on beaches and coastal resources, and significant public and private investment in coastal areas, sea level rise is of particular concern to the State of Florida. In areas with gently sloping shorelines, the horizontal advance of the sea can exceed 150 to 200 times its vertical rise.

2004 population estimates indicated that Florida had about 17.5 million residents and the vast majority live and work near coastal areas. Approximately 72% of the Treasure Coast population resides in Palm Beach County. The population is projected to grow by approximately 59% over the next 25 years. Much of this growth is expected to occur in the region's urbanized coastal communities. Of the municipalities and counties in the region, 72% have jurisdiction over land that is directly adjacent to the Atlantic coast, lagoon system, or Intracoastal Waterway. This includes 23 of the 38 local governments in Palm Beach County.

The upland areas most likely to be affected by sea level rise represent about 4.3 % of the total area of Palm Beach County. The main areas of impact are expected on the barrier islands and areas east of the Intracoastal Waterway; shorelines of the Indian River Lagoon, Lake Worth Lagoon and other estuaries; shorelines of the Loxahatchee River; shorelines of several inland waterways; and within islands in the lagoon and river systems. The municipalities that boarder the ICW or Atlantic Ocean have the greatest potential to be affected by sea level rise. The following 23 municipalities in Palm Beach County are susceptible to sea level rise:

- City of Boca Raton
- City of Boynton Beach
- Town of Briny Breezes
- City of Delray Beach
- Town of Gulf Stream
- Town of Highland Beach
- Town of Hypoluxo
- Town of Juno Beach
- Town of Jupiter
- Town of Jupiter Inlet Colony
- Town of Lake Park
- City of Lake Worth
- Town of Lantana
- Town of Manalapan
- Village of North Palm Beach
- Town of Ocean Ridge
- Town of Palm Beach
- City of Palm Beach Gardens
- Town of Palm Beach Shores
- City of Riviera Beach
- Town of South Palm Beach
- Village of Tequesta
- City of West Palm Beach



Previous Occurrences

There are warning signs that sea level rise may already be impacting Palm Beach County in subtle ways such as intrusion of salt water into freshwater supplies, beach erosion, reduced coastal drainage capacities, etc.

Palm Beach County Recognized As “Erosion Hotspot”

At the first of four scheduled Florida Climate Change summits (April 4, 2007) organized by Chief Financial Officer Alex Sink and Agriculture and Consumer Services Commissioner Charles Bronson, Stephen Leatherman, renowned beach expert and Director of the International Hurricane Research Center at Florida International University singled out Palm Beach County as “an erosion hot spot.” A warning coming out of the session was that “If global warming continues at the rate of acceleration currently experienced, Palm Beach County could disappear within less than a century.”

Natural sand flow patterns along the Palm Beach County coastline have been altered by human activity such as inlet creation, construction on the coastal dune and coastal armoring, over the past hundred years. The result has been an uneven distribution of sand, accelerating erosion, endangering both recreational and commercial interests. Proposed “solutions” to this problem have been numerous and diverse, some experimental, but always costly. Over the past fifty years, Florida taxpayers have paid hundreds of millions of dollars for dredge and fill projects alone. Most of the methods used to date have proven to be short-term in duration and therefore a questionable use of taxpayer dollars. State and County Officials must consider long-term solutions, with the input of the scientific community, other experts, non-governmental organizations, coastal user groups, and the community at large.

Following Tropical Storm *Andrea*, on May 14, 2007, a State of Emergency was issued by Florida DEP Secretary Michael W. Sole for three general areas in Palm Beach County: Jupiter, Singer Island, and the area from the Lake Worth Pier to Lantana. These same areas were problematic with Tropical Storm Fay in 2008.

Saltwater Intrusion at Our Doorsteps

In 2007, water managers shut down or reduced pumping from several public supply wells along South Florida’s East Coast to reduce saltwater intrusion from the Atlantic Ocean into the freshwater Biscayne Aquifer. According to a July 6, 2007 article in the Sun Sentinel, South Florida Water Management District estimates that saltwater intrusion already reaches 3 miles inland along some parts of the coast. Lantana and Lake Worth were two of four communities identified as forming the “front line” in a defense against saltwater intrusion. Sixty day shutdowns or reduced pumping from several wells close to the coast were ordered when rising salt waters were detected by the District.

Probability of Future Occurrences

Continued sea level rise is virtually a certainty in the near term, regardless of mitigation measures taken. There is a strong belief among scientists that the rate of rise will continue to accelerate.

Vulnerability & Impact Assessment

Portions of twenty three of the county's 38 municipal jurisdictions and the unincorporated county are located directly adjacent to the Atlantic coast, Intracoastal waterway or lagoon system, exposing a significant percentage of the county's assets and population at risk to the impacts of sea level rise. In addition to the direct impacts of increased flooding, erosion and an increased frequency and severity of storm surge, sea level rise can also lead to contamination of critical freshwater supplies through salt water intrusion into canals, groundwater aquifers and low lying coastal wetlands. Even the Everglades ecosystem could be at risk.

Longer term challenges will likely include making difficult choices between the costs for coastal protection versus the costs for land use relocation, population and infrastructure migration, costs associated with property disruptions caused by flooding. Residents and business owners will also have to face the problems created by the continued withdrawal of risk coverage by private insurers.

Projected Rise in Sea Level

A number of projections have been developed for sea level rise in Palm Beach County. These include sea level rise inundation projections by the Southeast Florida Regional Climate Change Compact (SFRCCC) and cumulative projections of sea level rise and storm surge by the Florida Division of Economic Opportunity using methodologies consistent with SFRCCC models. The conclusions and observations of these analyses and projections are detailed in the Special Appendices of this Volume.

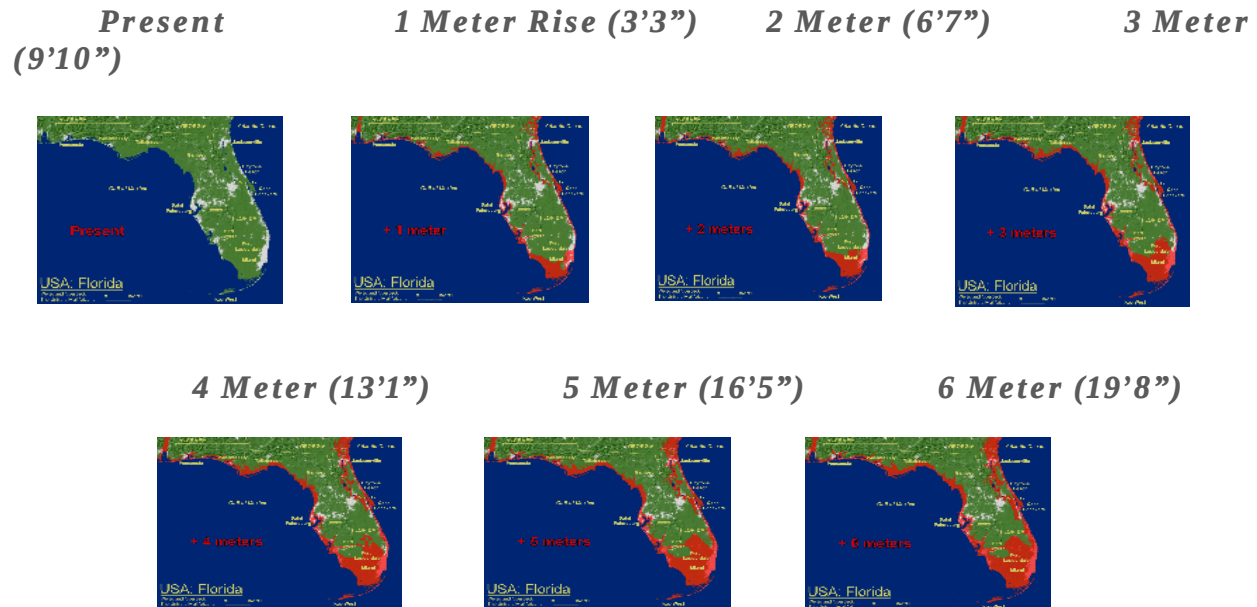
Long-Term Vulnerability

Scientists have been worried for decades about the melting of the West Antarctic Ice Sheet. A study published by Jonathan Bamber in *Science Magazine* in May 2009 reported that if it were to collapse, global sea level would rise drastically, but not as much as predicted 30 years ago. Bamber's group concluded that if West Antarctica collapsed catastrophically, global sea level would rise by approximately 11 feet, not 20 feet as earlier research warned. Bamber used new geological data about Antarctica and was able to refine how much of the ice sheet is actually vulnerable to a runaway collapse. Using radar and gravity data, they now have a much better idea of the shape of the ice cap and the rock below. But, they also advise readers that sea level will not go up the same everywhere. The massive weight of the West Antarctic ice sheet creates a gravitational pull that currently piles up ocean water in the southern ocean. If the ice sheet melts, the earth's gravity field will shift and water will flow north. Consequently, sea level will rise more on some coastlines and less on others. Even with the lower overall sea rise estimates, many coastal cities around the world will gradually find themselves under water. Unfortunately, the southeastern coast of Florida could see a sea rise as much as 25% above the global average increase. The good news is it should be a long, slow process.

The maps below show graphic approximations of what impacts various levels of sea level rise will have on the Florida coasts.



Impacts by Level of Sea Rise on Florida Coasts



Source: Weiss & Overpeck, Univ. of Arizona

Potential Impacts of Sea Level Rise

Some of the many potential impacts sea level rise may have on Palm Beach County include the following:

- Damage to/loss of coastal lands, facilities, infrastructure
 - Property damage/loss
 - Retreat/relocation/protection/accommodation
- Beach and dune erosion
 - Impacts on tourism/recreation
 - Environmental impacts
 - Wildlife/marine life (coastal/offshore)
 - Fauna
 - Water quality
 - High renourishment costs
- Increased tidal/storm surge inundation
- Progressive salt water intrusion into critical fresh water sources
 - Wells
 - Aquifer
 - Water borrowing costs
 - Desalinization costs
- Drainage system impacts
 - Inland backup from increased tailwater elevations
- Branding impacts (diminished unique marketing appeal)
- Insurance availability, cost
- Government/public burden backlash

- Property rights
- Marine impacts
 - Marina reconfiguration costs
 - Inlet shoaling

Levels of Protection Designations

Adapting the approaches taken by a number of other states SWFRPC and EPA, with input from the Regional Planning Councils, developed a set of criteria that differentiate uplands of 0 to 10 feet in elevation and within 1000 feet of shoreline into the following four general categories in terms of anticipated protection from future erosion and inundation: protection almost certain; protection reasonably likely; protection unlikely; and no protection from erosion and inundation in the future. These four categories are described in greater detail below.

Typically, residential, commercial, recreational and industrial lands were determined to be “almost certain” or “reasonably likely” to be protected. Undeveloped property, including privately owned property, agricultural land, minimally used parks, and dredge spoil areas were generally assigned the “protection unlikely” designation. Public and privately owned conservation areas were identified as “no protection.”

Protection Almost Certain

Coastal lands in the Treasure Coast Region have very high property values, compared with the costs of shore protection. Therefore, most areas that have been developed, as well as undeveloped land in designated growth areas, are almost certain to be protected. Four land-use categories are designated as “protection almost certain.” The first land-use category is existing developed land within extensively developed areas and/or designated growth areas. The second category is future development within extensively developed areas and/or designated growth areas. The developed land and future growth areas include residential, office/commercial and industrial uses. It is understood that every effort will be made to protect highly developed land from saltwater intrusion. This is due to the economic value of these lands and the high population density in these areas. The third land-use category that has been deemed as “protection almost certain” is parks that are used extensively for purposes other than conservation and have current protection or are surrounded by protected lands. Examples of this type of land are parks with highly used launching ramps located on-site. These parks are almost certain to be protected from sea level rise because they exist primarily for recreation and not exclusively for conservation purposes. Finally, mobile home developments outside of coastal high hazard areas connected to central sewer and water were included in this category.

Protection Reasonably Likely

These areas will probably be protected, but unlike the areas where shore protection is certain, there may be plausible reasons why these shores might not be protected. The land uses within this scenario include less densely developed areas, future development outside of growth areas, extensively developed CBRA coastal areas and private beaches. Parks used for purposes other than conservation, future development where a park or refuge is planned, agricultural areas with historical shore protection, and military lands

where protection is not certain are also included in this category. As with the previous scenario, it is easy to assume that these mostly privately owned areas are too valuable to abandon. However, because these areas are not extensively developed yet, they have not reached the point of critical mass where it would be inconceivable for policymakers and landowners to allow them to retreat.

Protection Unlikely

Several areas exist in the region where shores seem unlikely to be protected. Identifying these areas is important for at least two reasons. First, the unlikelihood of long-term shore protection implies that people thinking about building structures in such an area must recognize that the land will probably eventually be given up to the sea. Second, environmental planners can reasonably assume that wetlands or beaches will eventually migrate onto these lands. Because there is no expectation of shore protection, conservation easements that ensure long-term wetland migration should be relatively inexpensive. Areas unlikely to be protected are places where lands are probably going to retreat, but where there is no absolute policy against shore protection. Generally, these are areas where land values are low compared with shore protection. In the case of privately owned non-conservation lands, shore protection would not be cost effective compared to the value for the land. Land expected to become part of a nature reserve, but not guaranteed, are also in this category. “Protection unlikely” areas include: undeveloped privately-owned lands; un-bridged barrier islands; lightly developed coastal high hazard areas; minimally-used parks; and undeveloped areas where most of the land will be part of wildlife refuge; but where future development is planned and/or conservation easements preclude shore protection.

No Protection

This scenario includes lands that are certain not to be protected, because they are conservation lands where shore protection is absolutely prohibited. Private lands owned by conservation groups, conservation easements that preclude shore protection; wildlife refuges and parks with a policy preference for natural occurring processes and public lands/parks with little or no prospect for public use are within this category.

Level of Protection Areas in Palm Beach County

The upland areas most likely to be affected by sea level rise represent about 4.3 % of the total area of Palm Beach County. The main areas of impact are expected to be the barrier islands and areas east of the Intracoastal Waterway (ICW), shorelines of the Indian River Lagoon, Lake Worth Lagoon and other estuaries, shorelines of the Loxahatchee River, shorelines of several inland waterways, and islands in the lagoon and river systems. The municipalities that boarder the ICW or Atlantic Ocean have the greatest potential to be affected by sea level rise. These include the 23 municipalities listed earlier.

The barrier islands in Palm Beach County include Jupiter Island north of the Jupiter Inlet, Singer Island north of the Lake Worth Inlet, and Palm Beach Island south of the Lake Worth Inlet. Nearly the entire shoreline along the Atlantic Coast, lagoon systems, and inland waterways of Palm Beach County is developed and classified as “Protection

Almost Certain.” One exception is the area just south of the Jupiter Inlet (Carlin Park) designated as “Protection Reasonably Likely.”

The barrier island at MacArthur Beach State Park is considered “No Protection”. Because this portion of the barrier island is very narrow it would be possible for the Island to be breached at this location. However, it is unlikely this breach would interrupt travel on State Road A1A which runs on the west side of the island. While the breach might be allowed to remain, local planners have indicated that the road would be repaired and protected if it is impacted by a hurricane.

The only sizable “Protection Unlikely” area in the county is Peanut Island, located adjacent to the Lake Worth Inlet. Peanut Island is home to a Palm Beach County Park with newly constructed recreational facilities, restored and created fish and wildlife habitat, Palm Beach Maritime Museum, historic former U.S. Coast Guard Station, and dredged material management area used by the Florida Inland Navigation District and the Port of Palm Beach. The low lying historic structures in the red area on the south side of the island would likely be protected.

Nearly the entire length of the county is classified as “Protection Almost Certain” on the western shore of the Intracoastal Waterway and lagoon systems. This includes a portion of the downtown area of the City of West Palm Beach. This area also includes two main critical facilities, the Port of Palm Beach and FPL Riviera power plant, which are both located on the western shore of Lake Worth Lagoon in the City of Riviera Beach. Sea level rise issues should play an important role in the future planning for these facilities.

The sea level rise map identifies the areas adjacent to several inland canal systems as “Protection Almost Certain.” These freshwater canals are managed by the SFWMD for flood control purposes. For example, the C-17 canal typically has a discharge elevation set from 8 to 9 feet above sea level; the C-51, C-16, and C-15 canals are typically controlled at from 8.5 to 9.5 feet; and the Hillsborough canal is typically controlled at an elevation from 7.5 to 8.5 feet. These areas were included in the mapping because the discharge elevations of these canals are below 10 feet above sea level. However, the land adjacent to these canal systems is generally above 10 feet in elevation.

Response & Mitigation Strategies for Sea Level Rise

The Coastal Zone Management Subgroup of the Intergovernmental Panel on Climate Change has identified three basic strategies for responding to rising sea levels. They are as follows:

Retreat

This is the strategy of abandoning lands and structures in coastal zones and allowing marine ecosystems to move inland. In this response, there is no effort to protect the land from sea level rise. Governments exercising the retreat option generally prevent development in prone areas, allow development with conditions for abandonment (e.g., rolling easement) and/or withdraw subsidies for construction in danger zones. Governments can restrict development in coastal areas through a variety of policies. These approaches usually include land acquisitions, setbacks, low densities, planning

and zoning restrictions on coastal land use, and banning the redevelopment of damaged structures.

Accommodation

This strategy allows for land use and occupancy of vulnerable areas to continue, but with no attempts to prevent flooding or inundation. It is a hybrid of retreat and protection, because structures are protected while floodplains and shorelines advance farther inland. Governments favoring accommodation can strengthen flood preparations, prohibit activities that may destroy protective coastal resources and/or deny government flood insurance coverage of inhabitants of vulnerable areas. Strengthened flood preparations may include countering rising seas and high winds through building code requirements, improvement of drainage, and education. Like retreat, accommodation requires advance planning by local governments. Local governments must also accept that valuable land may be lost to rising seas. Although accommodation is a common short-term response, it may be less useful in the long run. While it may be practical in some circumstances to maintain habitable homes as wetlands advance onto people's yards, eventually the wetlands would become inundated and homes would be standing in the water.

Protection

This strategy involves using structural, defensive measures to protect the land from the sea, so that land use can continue. Shores can be protected by hard structures such as seawalls, revetments, and dikes, or by soft structural techniques like beach nourishment and elevating land surfaces with fill. Unlike the first two options, protection has a dramatic impact on both the immediate environment and ecosystems beyond the immediate area. The costs to wetlands, unprotected uplands and offshore fisheries must be assessed before protective measures are constructed.

Likely Local Responses

A total of 56,535 acres of uplands and 4,001 acres of wetlands were identified in the Palm Beach County portion of the SWFRPC study. Specific areas were rated into categories in terms of the anticipated response to sea level rise and mapped. The "Protection Almost Certain" category accounts for about 93.0% of the uplands in the study area in Palm Beach County. The combination of the "Protection Almost Certain" and "Protection Reasonably Likely" categories accounts for 96.7 % of the uplands mapped in the county. The wetlands remaining in the Palm Beach County portion of the study area account for only 16.7 % of the wetlands identified in the region. The county has no significant concentrations of areas classified as "Wetlands," and there are little or no opportunities for the inland migration of wetlands in Palm Beach County. The map below depicts these resulting classifications county-wide.

In its September 2005 *Sea Rise Project Final Report*, the South Florida Regional Planning Council offers the following views on protective measures. They apply, in general, to Palm Beach County.

"On the Atlantic Coast, manmade structures and beach renourishment are common and expected to continue in the future. Much of the land immediately adjacent to the coast is

of technological origin, having been dredged and filled with benthic materials to form the canals and waterfront lots at great cost in a speculative market. The value of this land has become so great as to suggest the raising of seawalls and the importation of additional fill incrementally over the Study period to protect property investments is very likely. The issue becomes the method by which property owners and local governments (dependent on the tax base provided by waterfront properties) cooperate and fund the necessary activities to prevent inundation, including the elevation or replacement of infrastructure to serve those properties. To the south and west, the system of levees currently in place to keep freshwater from intruding into urban areas will likely keep seawater from doing the same thing. Doubtless, as the sea would pound against these earthen dikes, they will require armoring to prevent erosion, and, perhaps, elevation to prevent overtopping by waves during storm events. This, too, will require advance planning and cooperation to implement. South Florida can use the recent experience of New Orleans in Hurricane Katrina as a cautionary tale regarding this potential solution.

If current trends of sea level rise continue, the majority of south Florida's vast freshwater wetlands will likely become saltwater marshes. Fortunately, opportunities exist for the retreat and migration of habitat types northward into the interior on government-owned land. The problem of saltwater intrusion to the sole-source Biscayne Aquifer will require greater investments in desalination technology to continue to provide south Florida with drinkable water. The real threat is to those rare and endangered habitats indigenous to the Florida Keys for which there exist no opportunities for inland migration. Aside from the logistics of protecting developed areas, this is the topic which will require the greatest study and dedication of resources." More detailed discussions of adaptation strategies and potential actions are contained in the Special Reports Appendix A. In particular, attention is called to: *Sea Level Rise Vulnerability and Redevelopment Assessments and Strategies: Palm Beach County* (a special vulnerability assessment done for Palm Beach County by the Florida Department of Economic Opportunity as part of a demonstration pilot project) and Excerpts from Southeast Florida Regional Climate Change Compact's 2011 *Action Plan*.

Current & Proposed Policies Relevant to Sea Rise

At this writing, Palm Beach County's Comprehensive Plan does not specifically address the issues of sea level rise. It does, however, contain several objective statements relevant to the subject. In response to the Treasure Coast Study, planners in Palm Beach County indicated a willingness to consider adoption of several policies specifically addressing the issue of sea level rise. These objectives and policy statements are as follows:

Objective 1.2: Shoreline Protection. Palm Beach County shall protect, enhance and restore the beaches and dunes through implementation and maintenance of the Palm Beach County Shoreline Protection Plan.

Objective 2.2: Public Subsidy of New Coastal Development. Palm Beach County shall not subsidize new or expanded development in the coastal area.

Objective 2.3: Development in High Hazard Area. Palm Beach County shall direct population concentrations away from known or predicted coastal high-hazard areas and shall not approve increases in population densities in the coastal high hazard area.

Proposed Policies

Policy 1: Consider the impact of sea level rise in all land use amendments in coastal areas less than 10 feet in elevation.

Policy 2: Obtain detailed topographic maps showing one foot contours in the coastal zone to assist in planning for sea level rise.

Policy 3: Develop a plan to protect or relocate all critical public facilities that are located in areas projected to be impacted by sea level rise in the next 50 years.

Policy 4: Closely monitor updates to sea level rise forecasts and predictions.

Policy 5: Develop a sea level rise response plan that specifically identifies the areas where retreat, accommodation and protection will be implemented.

Federal Policies and Programs

While a few federal policies specifically deal with the problems of sea level rise, a number of policies address the effects of sea level rise, such as flooding, erosion, and wetland loss.

These policies are included in the Coastal Zone Management Act (CZMA), the Coastal Barrier Resources Act, the Clean Water Act and the Rivers and Harbors Act and National Flood Insurance Act.

The Coastal Zone Management Act of 1972 is the federal law that created and guides the United States' coastal management programs. Congress created the CZMA to deal with the threats to the country's coastal zone caused by increasing and competing demands on the land and water of the zone. The CZMA establishes the coastal management policy of the United States as preserving, protecting, developing, and where possible, restoring or enhancing the resources of the nation's coastal zone by encouraging and assisting the states to exercise to develop and implement their own coastal management programs. Congress also specifically addressed the issue of sea level rise in the Act:

"Because global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence."

"The Congress finds and declares that it is the national policy --- the management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to sea level rise, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands".

The provisions of the CZMA are realized through the Coastal Zone Management Program (CZMP), which is administered by NOAA. The CZMP is a voluntary federal-state partnership that has provided cost-sharing grants to states to develop and implement their own coastal zone management plans. The CZMP has based eligibility for federal approval of state plans on several factors. Each state's plan is required to define boundaries of the state's coastal zone and identify uses within the area regulated by the state plan, the criteria for regulating such uses and the guidelines uses within the coastal zone. Subsequent to approval of the plan by NOAA, grants are awarded for implementation of the state's coastal management plan. In addition to providing financial assistance, the CZMP also supports states by offering mediation, technical services and information, and participation in priority state, regional, and local forums.

Thirty-four states and territories with federally approved coastal management programs are participants in the CZMP. Almost all of the nation's shoreline (99.9%) is currently managed by the CZMP. A major benefit of the CZMA is ensuring policy makers consider sea level rise when they create their own coastal management plans.

A second piece of federal legislation that has a bearing on coastal management policies is the Coastal Barrier Resources Act (CBRA), which was enacted in 1982. CBRA was designed to protect barrier islands along the United States coast. Coastal barrier islands are located off of the mainland coast and protect the mainland by receiving the majority of the ocean's energy contained in winds, waves and tides. Coastal barriers also protect and maintain productive ecosystems that exist within this protective zone. In drafting the law, Congress found that certain actions and programs of the Federal Government have subsidized and permitted development coastal barriers and the result has been the loss of barrier resources, threats to human life, health, and property, and the expenditure of millions of tax dollars each year.

CBRA established a Coastal Barrier Resources System, which designated various undeveloped coastal barrier islands for inclusion in the System. The boundaries of the System are contained on maps kept by the Department of the Interior. CBRA prohibits various federal actions and policies from occurring on islands within the System. The Act places several restrictions on Federal government spending on expenditures that encourage development or modification of a coastal barrier. No new expenditures or federal assistance can be used on coastal barrier islands for the following projects:

- The construction or purchase of any structure, appurtenance, facility, or related infrastructure;
- The construction or purchase of any road, airport, boat landing facility, or other facility on or near a bridge or causeway to any System unit; and
- The carrying out of any project to prevent the erosion of, or to otherwise stabilize, any inlet, shoreline, or inshore area, except that such assistance and expenditures may be made available on (certain designated units) for purposes other than encouraging development and, in all units, in cases where an emergency threatens life, land, and property immediately adjacent to that unit.

Notwithstanding the previous restrictions, CBRA does provide exceptions to limitations on a variety of expenditures with the barrier system. These include military and Coast Guard activities; maintenance of federal navigation channels; maintenance of certain publicly owned roads, structures and facilities; scientific research; and non-structural projects for shoreline stabilization that mimics, enhances or restores a natural stabilization system. Non-structural shore erosion control projects usually use bioengineering to create protective vegetative buffers stabilizing stream banks and shorelines and creating near-shore habitats for aquatic species and waterfowl.

Another feature of the Act is the prohibition of national flood insurance or HUD assistance to any projects within the barrier system that facilitate an activity that is not consistent with CBRA's provisions. CBRA is a good start in the prevention of development in areas that will be most affected by the effects of sea level rise.

The National Flood Insurance Program (NFIP) is another important component of federal coastal management policy. The NFIP is administered by the Federal Emergency Management Agency (FEMA), with its primary goals being to save lives and reduce future property losses from flooding. The NFIP is a voluntary program based upon a mutual agreement or partnership between the federal government and local communities. This partnership provides that the federal government will make federally backed flood insurance available to home and business owners in communities that agree to adopt and enforce comprehensive floodplain management standards designed to reduce flood damages. NFIP transfers most of the costs of private property flood losses from the taxpayers to people that choose to live within floodplains through insurance premiums and increased construction standards.

Community response to this requirement involves the adoption of land use, zoning and building code standards that, at a minimum, include the design and construction standards of the NFIP. The minimum NFIP design and construction standards are applicable to all new construction, substantial damages and substantial improvements to existing structures located in Special Flood Hazard Areas or in Special Flood Hazard Areas that have not yet been identified by FEMA. The Special Flood Hazard Areas represent the statistical chance of a 100-year flood occurring in any given year. The 100-year flood has a one-percent chance of occurring in any given year.

NFIP imposes stricter requirements on communities in the V-Zones of Flood Insurance Rate Maps. These are locales in coastal high hazard areas located along coastlines that are subject to high water levels, wave action, and erosion from strong storms and hurricanes. The wind and resultant waves and tidal surges associated with these storms cause water of high velocity to sweep over nearby land. Generally, the V-Zone indicates the inland extent of a three-foot breaking wave atop a storm surge. These areas are extremely hazardous to life and property.

There are a number of building requirements that NFIP requires for new construction or substantial improvements in coastal high hazard areas to be able to withstand wind and waves.

New buildings and improvements must:

- obtain and maintain the elevation of the bottom of the lowest horizontal structural member of the lowest floor;
- be located landward of mean high tide and no new construction is allowed over water;
- be elevated so that the bottom of the lowest horizontal structural member of the lowest floor is at or above the base flood elevation on a pile or column foundation;
- allow the space below the lowest elevated floor to be free of obstruction or must be:
 - enclosed with non-supporting breakaway walls, open lattice-work, or insect screening
 - designing to collapse under wind and water loads without causing damage to structural
 - supports or the elevated structure;
- not use fill for structural support of buildings; and
- prohibit manmade alteration of sand dunes and mangrove stands that would increase the potential flood damage.

The Coastal Barrier Resources Act (CBRA) prohibits new NFIP coverage for new or substantially improved structures in any coastal barrier in the CBRA system.

The Clean Water Act of 1972 is another federal law that has an impact on the health of our nation's coastal areas and wetlands. Sections 404 of the Clean Water Act sets national policy for the discharge of dredged or fill material into the nation's navigable waters and adjacent wetlands. The Act has even been interpreted to have authority over inland wetlands. Section 404 gives jurisdictional responsibility for issuing dredge permits to the COE. The EPA has responsibility for developing and interpreting the criteria used in permit issuances.

Another federal law that gives the Corps of Engineers (COE) additional authority over construction in navigable waters and wetlands is the Rivers and Harbors Act (RHA). Sections 9 & 10 of the Act authorize the COE to regulate the construction of any structure or work within navigable waters of the United States. The types of structures the RHA allows the COE to regulate include: wharves, breakwaters, or jetties; bank protection or stabilization projects; permanent mooring structures, vessels, or marinas; intake or outfall pipes; canals; boat ramps; aids to navigation; or other modifications affecting the course, location condition, or capacity of navigable waters.

When issuing permits for construction of the aforementioned structures, the COE must consider the following criteria: (1) the public and private need for the activity; (2) reasonable alternative locations and methods; and (3) the beneficial and detrimental effects on the public and private uses to which the area is suited. The COE is also required to consult with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to protect and conserve wildlife resources.

State Policies and Programs

Few State policies currently in effect specifically address the issue of sea level rise. However, State coastal guidelines that cover beach management policies have relevance to sea level rise concerns. These policies are included in the Coastal Construction Line Program, the Beach Erosion Control Program, Coastal Building Zone and Strategic Beach Management Plans of the State of Florida.

The Florida Beach and Shore Preservation Act was enacted by Florida's legislature to preserve and protect Florida's beach and dune system. Beaches and dunes are the first line of defense against storms, acting as a buffer between the sea and coastal development.

One of the programs authorized by the Beach and Shore Preservation Act to be an essential element in the protection effort is the Coastal Construction Control Line (CCCL) Program (Beach and Shore Preservation Act, Florida Statutes Chapter 161). The CCCL Program was designed to protect Florida's beach and dune system from irresponsible construction that could weaken, damage or destroy the health of the dune system. Structures that are built too close to the sea can inhibit the beach and dune system from its natural recovery processes and can cause localized erosion. Improperly constructed structures are a threat to other nearby coastal structures should they be destroyed by storms. The CCCL Program gives the State the jurisdiction to apply stringent siting and design criteria to construction projects within the control line. The CCCL is not a setback line, but is rather a demarcation line of the State's authority. The CCCL is marked at the landward limit of coastal areas that are subject to the effects of a 100-year storm surge. While wind and flooding may intrude further inward than the 100-year storm surge area, effects landward of the CCCL are considerably within the CCCL. Within the CCCL, the State prohibits the construction or siting of structures that would cause a significant adverse impact to the beach and dune system, result in the destabilization of the system or would destroy marine turtle habitat. To meet these requirements, structures are required to be located a sufficient distance from the beach and frontal dune and must also be sited in a way that does not remove or destroy natural vegetation. The CCCL also requires all structures to be constructed to withstand the wind and water effects of a 100-year storm surge event. This involves creating structures that meet American Society Civil Engineering 7-88 Section 6 - wind design standards. Water standards include a foundation design to withstand a 100-year storm event--including the effects of surge, waves and scouring. There is no prohibition of rebuilding under the CCCL Program. Due to the effects of erosion, the CCCL Program discourages the construction of rigid coastal armoring (seawalls) and instead encourages property owners' use of other protection methods, such as foundation modification, structure relocation and dune restoration.

Another initiative to regulate coastal construction is the Coastal Building Zone (CBZ). The CBZ was established as part of the Coastal Protection Act of 1985 to protect coastal areas and to protect life and property. The CBZ is similar to the Coastal Construction Line Program in that it is a regulatory jurisdiction, rather than a setback line. The CBZ envelops land from the seasonal high water line to 1500 feet landward of the CCCL. In those areas fronting on the ocean, but not included within an established

CCCL, the Coastal Building Zone includes the land area seaward of the most landward V-Zone line, as established by NFIP's flood maps. The V Zone is an area likely to experience a wave greater than 3 feet high with storm surge or areas within the 100-year storm event used by the CCCL program. Local governments enforce the Coastal Building Zone, as a part of their building codes, rather than by the State.

Within the CBZ, new construction is required to meet the Standard Building Code 1997 wind design standard of 110 mph and 115 mph. As for water standards, structures are required to meet National Flood Insurance Program requirements or local flood ordinance requirements, whichever are stricter. Foundations must also be designed to withstand a 100-year storm surge. CBZ construction standards are less stringent than CCCL standards. This is due to the fact that NFIP flood maps have lower base flood elevations for 100-year storm events than do CCCL studies.

Another State effort to protect Florida's beaches, authorized by the Beach and Shore Preservation Act, is the Beach Erosion Control Program (BECP). The BECP is the primary program that implements the Florida Department of Environmental Protection's beach management recommendations. The BECP was created to coordinate the efforts of local, state, and federal governments in protecting, preserving and restoring Florida's coastal resources.

One of the activities of this program is the offering of financial assistance to counties, local governments and other special districts for shore protection and preservation efforts. The BECP will provide up to 50 percent of project costs. The mix between federal, state and local funds is different for each project. Beach management activities eligible for funding from the BECP include beach restoration and nourishment activities, project design and engineering studies, environmental studies and monitoring, inlet management planning, inlet sand transfer, dune restoration and protection activities, and other beach erosion prevention related activities.

Another interest of the BECP is the development and maintenance of a Strategic Beach Management Plan (SMBP) for Florida. The SBMP is a multiyear repair and maintenance strategy to carry out the proper state responsibilities of a comprehensive, long-range, state-wide program of beach erosion control; beach preservation, restoration, and nourishment; and storm and hurricane protection. The SBMP is divided into specific beach management plans for Florida's coastal regions.

Current Local Government Policies

Palm Beach County's Comprehensive Plans contains a coastal management element, but currently has no policies specifically relating to sea level rise. However certain goals, objectives and policies are relevant to sea level rise issues. Some of these objectives most relevant to sea level rise are summarized below:

Objective 1.2: *Shoreline Protection*. Palm Beach County shall protect, enhance and restore the beaches and dunes through implementation and maintenance of the Palm Beach County Shoreline Protection Plan.

Objective 2.2: *Public Subsidy of New Coastal Development.* Palm Beach County shall not subsidize new or expanded development in the coastal area.

Objective 2.3: *Development in High Hazard Area.* Palm Beach County shall direct population concentrations away from known or predicted coastal high-hazard areas and shall not approve increases in population densities in the coastal high hazard area.

Proposed Policies

Planners in each of the counties in the Treasure Coast Region have indicated a willingness to consider the adoption of policies specifically related to sea level rise. The following policy statements were recommended to Palm Beach County by the Treasure Coast Regional Planning Council for consideration:

Proposed Policy 1: Consider the impact of sea level rise in all land use amendments in coastal areas less than 10 feet in elevation.

Proposed Policy 2: Obtain detailed topographic maps showing one foot contours in the coastal zone to assist in planning for sea level rise.

Proposed Policy 3: Develop a plan to protect or relocate all critical public facilities that relocated in areas projected to be impacted by sea level rise in the next 50 years.

Proposed Policy 4: Closely monitor updates to sea level rise forecasts and predictions.

Proposed Policy 5: Develop a sea level rise response plan that identifies the areas where retreat, accommodation and protection will be implemented.

Additional proposed policy language for inclusion in the County's Comp Plan and other local documents is presented in the PDRP Plan Integration section of Volume 3 of this PDRP.

Closing Note:

The issues of sea level rise and its possible link to global warming are fiercely contested and debated subjects. Whether or not these represent naturally occurring cyclical phenomena or a long-term irreversible trend, mitigation of the effects of sea level rise warrants serious attention in the relative near-term at local, regional, state and federal levels if long-term benefits are to be derived.

For More Information

This edition of Palm Beach County's PDRP includes a number of special sections and mentions of sea level rise. They were prepared largely in response to a request from the Florida Department of Community Affairs/Department of Economic Opportunity to demonstrate how and where sea level rise could be appropriately integrated into local planning instruments. At times it was necessary, for illustrative purposes, to address the subject in terms of worst case scenarios despite evidence that the implications were not as significant for Palm Beach County as they are for other Florida communities.

The Special Reports Appendix (Appendix A) to this Volume of the PDRP contains and will be updated on an ongoing basis with excerpts, full reports, and links to the substantial research and writings being produced by the Southeast Florida Regional Climate Change Compact, the Florida Department of Economic Opportunity and Florida Division of Emergency Management, Florida Center for Environmental Studies (FAU), South Florida Water Management District, the Treasure Coast Regional Planning Council, and others.

Guide to Special Reports and Guidance Documents on Sea Level Rise

Overview of Local, Regional, State Activities Related to Sea Level Rise

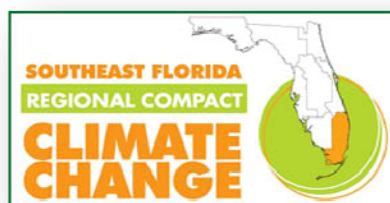
Sea level rise has been a topic of interest for many years in South Florida. Until recently, however, research and protective actions have been largely sporadic, independent, and unplanned. As awareness, consensus of opinion, and scientific evidence have grown, there has been a move in Southeast Florida toward multi-jurisdictional and multi-disciplinary collaboration and coordination. This shift has greatly accelerated progress in assessing vulnerabilities and developing appropriate community adaptation strategies and action plans.

Principal Organizations Focusing on Sea Level Rise in South Florida:

Southeast Florida Regional Climate Change Compact (SFRCCC)

In October 2009 Broward County hosted a well attended Regional Climate Leadership Summit. The purpose of this precedent-setting summit was to develop a regional collaboration that would support a coordinated climate change strategy. A major product of the summit was a four county compact executed in January 2010. The mission of the Southeast Florida Regional Climate Change Compact is to coordinate mitigation and adaptation activities across county lines. The Compact represents a new form of regional climate governance designed to allow local governments to set the agenda for adaptation while providing an efficient means for state and federal technical assistance and support.

In its short existence the Compact has accomplished several initiatives relevant to sea level rise and other climate related hazards. Some of these initiatives are described in the special reports section of Appendix A.



Florida Department of Economic Opportunity and Florida Division of Emergency Management

The Department of Economic Opportunity (FDEO) and the Florida Division of Emergency Management (FDEM) are principals in the State's Post-Disaster Redevelopment Planning Initiative. Following publication of its groundbreaking *Post-Disaster Redevelopment Planning: A Guide for Florida Communities* it was concluded that PDRPs represented excellent platforms for encouraging and facilitating sea level rise adaptation initiatives. FDEO, FDEM, and Calvin-Giordano and Associates, Inc collaborated on preparing an Addendum document on sea level rise. The Addendum document provides broad guidance on integrating sea level rise into PDRPs and other community plans and policies. Excerpts from the Addendum report are contained in Appendix A.

As part of their planning initiative, FDEO and FDEM selected Palm Beach County to be a demonstration case study. Products of this effort include detailed analysis and recommendations dealing with vulnerability assessment, plan integration, strategy development, and action planning which not only benefit Palm Beach County but will be useful to other Florida communities.



FAU -Florida Center for Environmental Studies & the ICCE

Impacts of climate change has been designated a Florida Atlantic University-wide Research Priority. FAU's Florida Center for Environmental Studies is the home of The Integrative Collaborative on Climate and Energy (ICCE).

Launched by Florida Atlantic University in the spring of 2009, the Integrative Collaboration on Climate and Energy (ICCE) is a cross-university program creating relevant linkages across disciplines. With FAU as the lead institution ICCE includes more than 80 faculty members in a multitude of climate change-related disciplines. Collectively, we have strong collaborative linkages with local, state and federal governmental and non-governmental organizations, the business community, and public. Other University collaborators include: University of South Florida, Florida Gulf Coast University, and Columbia University. ICCE's goals include:

- The use of the extensive knowledge base of ICCE members, partners and networks to develop unique interdisciplinary teams to advance basic and applied climate change research, linking science, social science and policy.

- The practical application of research conclusions by gathering, distilling and disseminating information about current and potential climate change impacts on south Florida and mitigation and adaptation priorities.
- Education and outreach activities in K through university, decision-makers and the business community

On June 21st and 22nd , 2012, The Florida Center for Environmental Studies hosted the “Risk and Response” Sea Level Rise Summit in Boca Raton, Florida with over 300 attendees from private and public agencies. The summit was sponsored by USGS, Florida Sea Grant, The Flora foundation, USF’s Patel School for Global Sustainability, Coastal Areas Climate Change Education (CACCE), NOAA, Wells Fargo, NRDC, The Community Foundation of Palm Beach and Martin Counties, Renaissance, The Northeast Regional Council, and The Florida Climate Institute. The purpose of the summit was three-fold:

1. To highlight the interrelationships between sea level rise, saltwater intrusion into fresh water aquifers and water management in Florida;
2. To share the ongoing responses and adaptation planning of agencies, institutions and civic societies to sea level rise; and
3. To compare Florida’s challenges and responses with other vulnerable localities in the US and worldwide.

Treasure Coast Regional Planning Council (TCRPC)

As part of an ongoing program evaluating global climate change, the Environmental Protection Agency has initiated a nationwide project promoting planning for and awareness of sea level rise. In 2000, the EPA issued a grant to the South West Florida Regional Planning Council (SWFRPC) to participate in this program and coordinate the study of sea level rise throughout the State of Florida. In 2002, the TCRPC entered into a contract with SWFRPC to conduct a study of sea level rise within the Treasure Coast Region. Excerpts from this study are contained in Appendix A of this PDRP.

South Florida Water Management District (SFWMD)

South Florida Water Management District, through its Interdepartmental Climate Change Group, continuously monitors research and developments in the areas of sea levels, temperatures, rainfall patterns and tropical storms in order to perform its water management mission. In monitoring changes rises and falls of temperature, precipitation, extreme events, and other climate factors, the District notes that many recent changes appear to be outside normal historical ranges of variability.

They predict, rising seas will likely have direct impacts on coastal beaches, infrastructure, and wetlands due to high tides and storm surges. Urbanized areas along the coasts may be more prone to flooding. Coastal water supplies could be impacted by accelerated saltwater intrusion. Natural systems may suffer significant impacts.

In its 2009 publication *Climate Change and Water Management in South Florida*, SFWMD suggests the following potential scenarios:

- Relative to 1990 level, a rise of 5 inches to 20 inches in sea levels by 2060. This range provides lower and upper bounds for planning purposes until better and more specific regional information on future sea level rise is available.
- An increase in air temperatures of up to 7°F and evapotranspiration up to 15 percent by 2100.
- A change in rainfall of up to ±20 percent.
- A change in the strength and frequency of tropical storms and hurricanes. Exact extent of the changes due to global warming is not clear at this time.

The full publication can be accessed at:

http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/climate_change_and_water_management_in_sflorida_12nov2009.pdf

Select Reports: Sea Level Rise in Palm Beach County

A significant number of special reports have and will continue to be prepared by researchers and subject experts on the potential impacts of sea level rise in Palm Beach County and South Florida. Brief summaries of select reports relevant for County planners, decision makers, and emergency managers are presented below. These reports, in their entirety or in the form of excerpted highlights, are contained in Appendix A.

Title: *Post-Disaster Redevelopment Planning: Addressing Sea Level Rise During Long-Term Recovery*

Author(s): Florida Department of Economic Opportunity; Florida Division of Emergency Management; Calvin, Giordano and Associates, Inc.

Purpose: Designed as an Addendum or companion document to *Post-Disaster Redevelopment Planning: A Guide for Florida Communities*. It is intended to augment best practices guidance related to coastal communities, considering how sea level rise adaptation strategies should be integrated into the long-term recovery and redevelopment process. The addendum focuses largely on Palm Beach County who served as a pilot community for Phase V of the state's post disaster planning initiative.

The Addendum explores a range of adaptation strategies which may be employed in the post-disaster environment to enhance sustainability and disaster resilience. It provides an assessment of how sea level rise scenarios may alter the impacts of future storms and provides recommendations for local decision makers to consider when addressing long-term sustainability in the aftermath of a large scale disaster.

Major Topics: Chapter 2 provides guidance on how to assess existing plans, policies, and programs that may exist within your community and support community adaptation. The Comprehensive Plan, the Local Mitigation Strategy, Economic Development Strategies, and Capital Improvement Plans are examples of plans which

may incorporate specific policies, funding strategies, or initiatives aimed to enhance long-term community sustainability.

This chapter also describes the process used for conducting a hazard vulnerability analysis to assess the risks and vulnerabilities posed by augmented hurricane storm surge due to the sea level rise. This hazard vulnerability analysis were used to produce a series of Geographic Information System based maps detailing vulnerable areas, structures, and facilities.

Chapter 3 explores a range of policy recommendations for long-term inclusion of sea level rise strategies within the post-disaster redevelopment planning process. The goal is to ensure that the full ranges of strategies are comprehensively addressed across organizations, jurisdictions, and disciplines. The chapter also offers sample policy language which each organization may **consider** during the plan update process.

Chapter 4 reflects upon opportunities to support the post-disaster implementation of sea level rise adaptation strategies.

The Addendum contains a detailed description of vulnerability assessment methodology and assumptions used for the pilot study and how describes how resulting Geographic Information System (GIS) based maps can be used to identify and describe potentially vulnerable areas, develop adaptation strategies and develop and implement informed action plans.

Title: *Sea Level Rise Vulnerability & Redevelopment Assessments & Strategies: Palm Beach County*

Author(s): Florida Department of Economic Opportunity; Florida Division of Emergency Management; Calvin, Giordano and Associates, Inc.

Purpose: This vulnerability assessment examines the influence of sea level rise on Palm Beach County's vulnerability to hurricane storm surge hazards as a basis for addressing sea level rise adaptation during post-disaster redevelopment efforts.

The report provides in-depth discussions of a full range of potential adaptation strategies.

Methodology: Assessments contained in the report model the potential increases of storm surge inundation in a hypothetical context of a three foot rise in sea levels.

Adaption response options are considered in three strategy areas, including protective strategies, retreat strategies and accommodation strategies.

This assessment evaluated the data from the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model provided by the U.S. National Hurricane Center (NHC),

National Oceanic and Atmospheric Administration (NOAA) to determine storm surge zones. SLOSH modeling integrates the maximum surge height for hurricanes of Saffir–Simpson Categories 1, 3, and 5. The model outputs were then converted by Geographic Information System (GIS) tools into raster grids. GIS tools were employed to delineate the effect of sea level rise on hurricane storm surge by enhancing the projected storm surge by an estimated three foot sea level rise projection. GIS was then employed to identify damages to critical facilities, groundwater, inland canals, property and infrastructure to future hurricane storm surge inundation. These data outputs provided a basis for an initial analysis of the impacts of sea level rise in Palm Beach County and provides a basis for community leaders and planners to discuss possible implications for adaptive response to create a more disaster resilient and sustainable community.

Using maps with inundation overlays and a series of tables and graphs, the hazard vulnerability analysis examined the following areas and offered post-disaster redevelopment and adaptation recommendations assuming a three (3) foot rise in sea level and Categories 1, 3, and 5 storm surge increases:

1. Transportation: This included ports/marinas, airports, roads, bridges, railways and Tri-Rail Stations, and bus routes.
2. Water infrastructure: This included water supply treatment plants, wastewater treatment plants, water pumping stations, well field protection areas, and water control structures and systems.
3. Land and Environment: This included Future Land Use composite, Land Use/Cover, Managed Natural Areas, Vulnerable Species, Critical Beach Erosion, and Beach Access.
4. Public facilities and privately owned facilities important to community redevelopment: This included emergency shelters, fire and police stations, and other government buildings such as hospitals, adult living facilities, hospice, skilled nursing facilities, city halls, libraries, courthouses, and emergency operations centers.

Title: *Southeast Florida Regional Climate Change Compact First Annual Progress Report* (Select Excerpts)

Author(s): Southeast Florida Regional Climate Change Compact

Purpose: Provides a description of activities and accomplishments for year one of the Compact. Topics include:

An overview of regional climate change vulnerabilities, a description of the county by county survey of resources, development of a greenhouse emissions inventory, a description of vulnerability analysis workshops, and results of efforts to agree on a unified projection of sea level rise for the region.

Title: *Analysis of the Vulnerability of Southeast Florida to Sea Level Rise – Palm Beach County*

Author(s): Inundation Mapping and Vulnerability Assessment Work Group of the Southeast Florida Regional Climate Change Compact

Purpose: Provides a geographic representation of sea level rise inundation flooding on maps using a simple bath tub analysis for three sea level scenarios of 1', 2' and 3', without consideration of other flooding impacts from hurricane storm surge, hydrological losses through canal structures, etc.

The report assesses and describes the vulnerability of county infrastructure, critical facilities, and a full range of other physical features to sea level rises of 1', 2', and 3'.

Title: *Impacts of Sea Level Rise on Florida's Domestic Energy and Water Infrastructure*

(Excerpts from Dr. Leonard Berry's Testimony to the United States Senate Committee on Energy and Natural Resources)

Author(s): Dr. Leonard Berry, Director of the Florida Center for Environmental Studies, Distinguished Professor of Geosciences at Florida Atlantic University and Co-Director of the Climate Change Initiative of the University.

Purpose: Dr. Berry's testimony provides a succinct overview of the threat of Sea Level Rise to South Florida and adaptation responses taking place or needing attention.

His testimony describes multiple complications sea level rise is already creating, including coastal and inland flooding, flood control issues, and salinization of aquifers and well fields.

Dr. Berry discusses expected future impacts that have major technical and cost implications for water, energy and resource management. He also recognizes some of the proactive measures taking place in Florida and identifies gaps requiring attention.

Title: *Draft Regional Climate Change Action Plan (Excerpts)*

Author(s): Southeast Florida Regional Climate Change Compact

Purpose: The plan provides for steps to move towards resiliency and reduce emissions through exploring alternatives and decreasing our use of Energy and Fuel. The plan builds upon our strength as effective emergency responders and integrates climate change hazards in Risk Reduction and Emergency Management planning. Finally, the Regional Climate Action Plan creates a common vocabulary for public Outreach and Public Policy development to effectively communicate the steps from risk to resiliency with the general public, voters, elected officials and decision makers in Southeast Florida, the state and the nation.



The specific recommendations put forth in this plan were developed through a collaborative process involving nearly 100 subject matter experts, not only climate professionals, from the public and private sectors, area universities and not-for-profit organizations. These stakeholders brought to the table the knowledge of their “craft” as well as information on successful initiatives already underway locally or in other communities. Many of the recommendations build upon best practices sprinkled throughout our region, such as regional collaboration on transportation planning and land use regulations that foster walkable and healthy communities. Others delve into “new” frontiers in calling for the integration of climate change into planning and decision making processes in ways that no local government has yet implemented.

There are 100 plus action items detailed in the plan’s six goal areas to be accomplished over the next five years with annual reports to mark progress. The six goal areas include:

- Sustainable Communities and Transportation Planning
- Water Supply, Management and Infrastructure
- Natural Systems and Agriculture
- Energy and Fuel
- Risk Reduction and Emergency Management
- Outreach and Public Policy

Policy recommendations will be implemented through several approaches including:

- the development of policy guiding documents by local and regional governing bodies;
- the development of operational guidance documents;
- the development of consistent goals and measures throughout the various governments in the region;
- a coordinated multi-disciplinary outreach and education program; and
- processes for focused and prioritized investments

Title: *Treasure Coast Vulnerability Analysis for Post-Disaster Redevelopment*
(Excerpts relating to Palm Beach County)

Author(s): Treasure Coast Regional Planning Council (TCRPC)

Purpose: The TCRPC vulnerability analysis focuses on the Treasure Coast counties of Palm Beach, Martin, St. Lucie and Indian River.

For this analysis, the worst case scenario of a 2 foot rise in sea level by the year 2060 was used to be consistent with the Southeast Florida Regional Climate Change Compact. A planning horizon of 50 years is particularly relevant for considering infrastructure vulnerability. In the context of the PDRP, a 50 year planning horizon could assist in making decisions regarding the cost effectiveness of rebuilding infrastructure damaged

by a disaster to the same standards if it is going to be at increasing risk from sea level rise in the future since the lifespan of the infrastructure project may well be beyond 2060.

This analysis also examines the increased storm surge that could result from a 2 foot rise in sea level by mapping estimated increases in storm surge for Category 3 and 5 hurricane scenarios. While permanent inundation from a 2 foot sea level rise scenario will have limited impacts on current development in the region, an increase in the area at risk from storm surge could be much more detrimental. Furthermore, the SFWMD found that using the low range of the Compact projections (i.e. 9 inches rather than 24 inches) that the probability of a 1 in 50 year storm surge can be expected to occur within a 5-year period.

The 2 foot Inundation Zone was developed consistent with the methodology used by the Southeast Florida Regional Climate Change Compact and the mapping process used by the NOAA Coastal Services Center. The analysis used a digital elevation model (DEM) derived from the latest available Light Detection and Ranging (LiDAR) data in addition to NOAA's VDatum Tool to create a tidal surface. The 2 foot rise in sea level was mapped on top of Mean Higher High Water (MHHW). Inundation Zones for Category 3 and Category 5 Storm Surge under the Sea Level Rise (2ft) Scenario were generated using the Statewide Regional Evacuation Study Surge Model Tool Version 2.9i6, created by Marshall Flynn with the Tampa Bay Regional Planning Council and used previously to produce the County level Storm Atlases of the Statewide Regional Evacuation Study Program.

The report analyzes the vulnerability of various types of residential, commercial, agricultural, institutional and governmental structures and their value in dollars at risk by county and municipal jurisdictions under each of the five categories of hurricanes.

Title: *Statewide Post-Disaster Redevelopment Planning Initiative: Sea Level Rise Integration: A Pilot Study for Palm Beach County*

Author(s): Florida Department of Economic Opportunity; Calvin, Giordano and Associates, Inc.

Purpose: This report describes the pilot case study done for Palm Beach County by the Florida Department of Economic Opportunity demonstrating opportunities for integrating sea level rise into county and municipal plans. It provides planning and policy considerations for Palm Beach County to incorporate the potential long-term impacts of hurricane storm surge increased by sea level rise.

The initial section evaluates existing plans and policies and begins to identify adaptation and mitigation policies within existing plans, policies, and procedures currently in force in Palm Beach County and among potentially impacted coastal municipalities. Plans reviewed for integration opportunities include: County and municipal Comprehensive Plans, the PDRP, the Unified Local Mitigation Strategy (LMS), National Flood

Insurance Program documents and the Palm Beach County Strategic Economic Development Plan.

The second section provides recommendations for long-term inclusion of sea level rise strategies within each of the existing planning documents to ensure that strategies are comprehensively addressed across organizations, jurisdictions, and disciplines. The chapter also offers sample policies and language which organizations may consider during their respective plan update processes.

Integrating Sea Level Rise into Local Plans

At this writing, county and municipal plans and policies do not specifically recognize the threat of sea level rise. Certain elements of these plans have relevance, but only by inference. As sea level rise and its associated impacts continue to grow in importance, specific language will need to be crafted and integrated into the full array of local plans to ensure consistency in policy and practice and to effectively guide long-term decisions and actions.

In late 2011 the Florida Department of Economic Opportunity selected Palm Beach County to serve as a demonstration case study for plan integration. With the assistance of Calvin, Giordano and Associates, Inc. a full range of relevant county and municipal policies and plans were reviewed to identify appropriate opportunities for integration of sea level rise language and recommended policies, priorities and guidelines that have emerged from the work of the County and Regional Compact. Among the plans reviewed were: County and municipal Comprehensive Plans, the PDRP, the Unified Local Mitigation Strategy (LMS), National Flood Insurance Program documents and the County's Strategic Economic Development Plan. The case study also developed and drafted sample policies and language for consideration during plan updates.

A comprehensive report of case study findings and recommendations is presented in a special report, *Statewide Post-Disaster Redevelopment Planning Initiative: Sea Level Rise Integration: A Pilot Study for Palm Beach County*. The report should be an invaluable tool for plan integration. A copy of this report can be found in Appendix A.

KEY REDEVELOPMENT ISSUES AND PRIORITIES

The Challenge of Governance during Long-Term Recovery

Among the most important requirements for successful long-term recovery are: having a clear vision and well-executed plan; the availability and management of broad and diverse funding to finance the recovery; establishing and maintaining effective working relationships at the local, state and federal level; and fostering a supportive and involved community. The single most important requirement for making this happen is effective local leadership.

In his book *Managing for Long-Term Community Recovery in the Aftermath of Disaster*, Daniel Alesch offers important insights into the post disaster pressures faced by local government officials. Some of these observations, derived from years of on the

ground interviews and research following extreme disaster events, are summarized below.

Government Recovery First

Like all organizations, local governments experience losses from major disasters. Governmental buildings and infrastructure are damaged or lost, financial arrangements are disrupted, data and files may be lost or destroyed, and employees may not return to work. In order for the county and municipal governments to help the community recover, they, themselves, must recover sufficiently to be effective recovery agents.

Increasing Workload Demands

Major disasters trigger exceptional workloads for public officials and employees. These heavy workloads, accompanied by periods of high stress, likely will begin before the event occurs and persist throughout long-term recovery.

Lack of experience at all levels in disaster management necessitates “on the job” training. Role conflicts may arise as those accustomed to working in relative isolation are asked to work cooperatively with others to solve complex problems.

Illustrative of these workload demands are the following:

New/Additional Responsibilities

Local officials find themselves dealing with two sets of demands at the same time, the regular local government functions that must continue, and a new set of unfamiliar disaster-related activities. The demands are intense and will continue for months without letup. Dealing with rotating staffs of state and federal agencies, many temporary help, often produces changing and conflicting answers to questions. Rules and regulations for various federal programs are often complex and change almost continually. Frustration often builds among local, state and federal officials, sometimes to the point of boiling into conflict.

Dissatisfaction with the Pace of Recovery

Decision makers invariably feel that progress isn’t being made quickly enough and that outcomes are not satisfactory. Elected officials, in particular, feeling pressure from constituents, may have unreasonable expectations about the pace of recovery and about what the local government staff is capable of accomplishing.

The Blame Game

To meet the public’s demand for accountability, fundamental attribution errors will be made, assuming that others are personally responsible for mistakes that are made, discounting the role of external factors or misfortune.

Balancing Work and Personal Responsibilities

In addition to the increased workload and the new problems that emerge daily, many public employees must confront the personal, inner conflict between the need to help strangers and the pressure to help their families at home. Employees, many

unaccustomed to the recovery role, will be expected to remain at their posts as needed during emergency situations, even when their homes and families need attention.

Dealing with Burnout and Stress Related Turnover

The pressures passed on by elected officials, by increased workloads, by unresolved issues, and by personal problems, may lead to burnout and stress related turnover. City managers, finance officers, and building officials are particularly vulnerable. Worker performance is likely to decline in the face of extreme and prolonged stress. Employees faced with the same, seemingly intractable problems day after day, will burnout and may look for an escape. Some may be fired, many may leave in frustration.

Ensuring Continuity of Leadership

Palm Beach County and most of its neighboring municipal jurisdictions maintain Continuity of Operations Plans (COOPs) covering a full range of critical functional areas. The County's COOP focuses on the functions of the Board of County Commissioners and County Administration. Depending on the extent of physical damage and operational disruption, the use of COOP plans, particularly County Administration's plan, may extend well into long-term recovery. The purpose of the COOP is to sustain, to the greatest extent possible, the capability to continue mission-essential business and functions. In the case of Administration, this involves providing uninterrupted leadership in conducting necessary County business as well as guiding and overseeing community recovery.

Key elements of the COOP include:

- Identification of mission-essential functions
- Orders of succession in county leadership
- Authorities, including emergency powers and authorities
- Alternate facilities
- Vital records and databases
- Resource inventories
- Staff rosters and capabilities

Beyond internal solutions, the use of standby officers and/or temporary officers could be employed.

Augmenting Staff

Exhaustion from long hours and a shortage of requisite skills invariably require local governments to augment their capacity through mutual aid, contracted help and/or temporary workers. The federal government will almost always cover the cost of people who are working on recovery, but it will not pay for people doing the routine business of running a local government.

Documenting Reimbursable Expenses

Federal project funds will generously flow into the community following declared major disasters. But after the money is gone and projects are completed (or in the process of being completed) the federal government auditors will arrive looking for documentation of eligible expenditures, for expenditures ineligible under the terms of the grants, for

errors and mistakes made by local officials, and for assurances that procedures were followed precisely. The auditors demand not just complete records on how every dime was spent, but compelling evidence that every dime was spent in compliance with program regulations. If they don't get the evidence they seek, they will seek to get some or all of the money back from the community.

Keeping track of expenditures following major events is not a simple task. The local government staff will be dealing with situations that it has not previously encountered, trying to do the job that it did before the disaster while also dealing with new demands that it has never faced before. Moreover, most federal program rules are complex, and not all agencies apply the same procedures. In addition, federal agencies may hire temporary personnel less knowledgeable about rules and regulations, raising the possibility for contradictory information.

Some communities have spent years and millions of dollars trying to resolve financial issues.

Dealing with Lengthy, Questioned Reimbursements

The federal government doesn't advance funds; it reimburses after expenditures have been made. Delays in reimbursement are common, particularly where state level involvement is required. Managing cash flow and arranging for bridge financing can become a problem.

Maintaining an overall view of local government finances and keeping the jurisdiction within safe limits requires more than accounting skills; it requires an understanding of finance, management, intergovernmental relations, and how the political system works.

Minimizing Nonessential Bureaucracy

Recovery requires local government to be flexible and adaptive. Managers and staff must be able to do things they have not done before and do things in ways they have never done them before. It is far easier to simplify processes beforehand, when there is time to give them serious thought, than to waive them or ignore them in time of crisis. In the aftermath there are not enough resources to do things that don't need to be done or that can be done more simply, and there is certainly not much time for contemplation or indecision.

Understanding and Capitalizing on Assistance Programs

A whole host of assistance programs are available from federal, state and private sources. Rather than waiting until after the event to find out which programs are available, local officials need to ensure every organization and person in the community understands which programs exist, what their eligibility requirements are, what their basic application and administration rules and regulations are, and how to maximize the probability of getting assistance from them. Some sort of clearinghouse should be set up at a central site or online. Of course, the best approach is to do a lot of the research up front, preferably before a disaster threatens. FEMA's *Public Assistance: A Guide to Recovery Programs* (FEMA-229) is an especially useful reference for locating recovery assistance programs.

Rebuilding a Financial Base for Sustainable Government

Long-term recovery of both the community and the local government require either rebuilding or developing anew a base of wealth, income and business activity that is adequate to provide the needed revenue for collective recovery actions. Unless that is accomplished, when the federal aid ends, the community and the local government will struggle and recovery will be slowed or stall.

Sustaining Essential Government Services in the Face of Post Disaster Economic Crisis

Relatively minor disasters like Hurricanes Frances, Jeanne and Wilma create scattered damages and short-lived, easily recoverable interruptions to local economies and government operations. Catastrophic disasters, on the other hand, can devastate local economies and greatly impair a community's ability to sustain or resume even the most basic governmental services.

All or some combination of the following economic and service impacts can be expected to accompany catastrophic events. Victimized local governments will suffer post disaster staff shortages due to casualties and relocation at the time they are most needed. Payrolls will be jeopardized by depleted financial reserves. Tax bases will not be replenishable because of interrupted revenue. Cash flow and consumerism will be interrupted by business closures. Governmental priorities will have to be reassessed and services scaled back. Resources may need to be redeployed in light of post disaster needs. Relief, recovery and reconstruction efforts will sap available capital. Credit ratings may plummet. Borrowing power may be reduced. Public service and debt obligations will continue and probably increase. It will be easy to get caught up in a vicious downward economic spiral.

Even if it is in a relatively strong pre-disaster financial position going into the event, Palm Beach County will likely require outside emergency financial assistance. Some smaller, more economically vulnerable, municipal jurisdictions almost certainly will become insolvent.

In short, catastrophic disasters cause serious and long-term disruptions to much of the core economic activity necessary to sustain essential governmental services. Unfortunately, such disruptions do not relieve local governments of their public service and financial obligations. In fact, these obligations will increase significantly in the aftermath of the event. With tax bases in disarray and reserves and insurance sapped or depleted, local governments must meet the three-fold challenge of continuing to provide services, rebuilding damaged infrastructure, and servicing existing debt.

Almost immediately after a catastrophic event and well into the recovery period, difficult decisions need to be made by the County and each local government as to how to replenish revenue bases or to otherwise compensate for shortfalls. With reserves and insurance depleted, recovery may take months or years. Redevelopment of a fully sustaining revenue flow can take a very long time. As with Andrew, Katrina and other catastrophic events, the economic landscape may never be the same and economic redevelopment may resemble a patchwork quilt.

On top of local concerns, Congress and the tax-exempt bond community will question to what extent tax base erosion may impair the ability of impacted local communities to make payments on outstanding debt and to issue new debt. A predictable outcome of a catastrophic disaster is being placed on CreditWatch with negative implications. In less than three months, Hurricane Katrina's economic dislocation prompted Standard & Poors and Moody's to cut the ratings of New Orleans and other regional issuers to below investment grade. General obligation debt, limited-tax debt and pension debt, in particular, took a big hit.

While there is precedent for imposing a short-term moratorium on enforcement of outstanding short-term obligations to avoid destructive actions (e.g., liens and judgments) during the time a city requires to regain its financial health, arguments for such protection are controversial and take considerable time to resolve. After much debate, rulings and appeals, the State of New York enacted an Emergency Moratorium Act for New York City to relieve it of certain short term financial obligations when it experienced grave financial difficulties in the mid 1970s. Whether such actions could be taken in Florida in response to a disaster is not known.

The unexpected loss of revenue due to catastrophic disaster damage, coupled with the increased financial burden of humanitarian relief, reconstruction and economic redevelopment will almost certainly require local governments to turn to state and federal government for financial assistance.

FEMA's Public Assistance Program provides supplemental Federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and infrastructure, but it cannot be applied toward operational costs. The Stafford Disaster Relief and Emergency Assistance Act also authorizes the President to "make loans to any local government which may suffer loss of tax and other revenues as a result of a major disaster, and has demonstrated a need for financial assistance in order to perform its governmental functions." The Community Disaster Loan Act, signed into law in October 2005, and subsequently proposed supplemental appropriations and interim rules, demonstrated Congress' acknowledgement that catastrophic events, like Katrina, warrant special attention to the financial plights of local governments and extraordinary levels of assistance as authorized by the Stafford Act.

While federal programs ultimately provide critical financial assistance, it is often too little, too late for economically fragile communities and always comes with a lot of strings attached. Less than two months after Katrina, and unable to sustain its payroll, New Orleans was forced to cut its city staff by 3,000 people (a 50% cut) and to seriously reduce its services while waiting for assistance through the Community Disaster Loan Program. Such actions are obviously contrary to the needs for recovery.

Palm Beach County communities are advised to consider other, more quickly implementable strategies that may help to relieve financial shortfalls in the near-term until federal help arrives.

Municipal Insolvency

By virtue of their size, limited reserves, and limited revenue sources, many Palm Beach County municipalities, unless well insured, will likely have difficulty weathering the economic impacts of extreme disaster events on their own. What do municipalities do when they suddenly become insolvent and the prospects of recovery through traditional revenue sources or tax increases have been blown away?

Florida Financial Emergencies Legislation

In 1979, the Florida legislature adopted a local government financial emergencies statute ([section]218.503). This legislation, one of the most specific of its kind in the nation, was developed not because of any local government financial emergency existing or threatened in Florida at the time, but in response to the problems of New York City, Cleveland, and other cities that were then in the midst of or had recently experienced a severe financial emergency. Since the statute has been in place, two major local governments - the City of Miami and Escambia County - have required state intervention, and the provisions of the act have been employed effectively in several smaller governments. According to recent Auditor General reports, more and more local governments have been deemed to be in or approaching financial emergencies. The deep recession of the past several years has no doubt driven more local governments to the brink. What then would the added impact of a catastrophic event bring?

The financial emergency statute obviously is intended for matters where financial management decisions and actions have been a problem. While no specific language or reference to disaster-caused financial emergencies is contained in the statute, it is assumed that the legislation and subsequent state actions would similarly apply if the following standard criteria are met:

Section 218.503(1), Florida Statutes, states that local governmental entities shall be subject to review and oversight by the Governor when any one of the following conditions occurs:

- Failure within the same fiscal year in which due to pay short-term loans or failure to make bond debt service or other long-term payments when due, as a result of a lack of funds.
- Failure to pay uncontested claims from creditors within 90 days after the claim is presented, as a result of a lack of funds.
- Failure to transfer at the appropriate time, due to lack of funds:
 - Taxes withheld on the income of employees; or
 - Employer and employee contributions for
 - Federal social security; or
 - Any pension, retirement, or benefit plan of an employee
- Failure for one pay period to pay, due to lack of funds:
 - Wages and salaries owed to employees; or
 - Retirement benefits owed to former employees.

- An unreserved or total fund balance or retained earnings deficit, or unrestricted or total net assets deficit, as reported on the balance sheet or statement of net assets on the general purpose or fund financial statements, for which sufficient resources of the local governmental entity, as reported on the balance sheet or statement of net assets on the general purpose or fund financial statements, are not available to cover the deficit. Resources available to cover reported deficits include net assets that are not otherwise restricted by federal, state, or local laws, bond covenants, contractual agreements, or other legal constraints. Fixed or capital assets, the disposal of which would impair the ability of a local governmental entity to carry out its functions, are not considered resources available to cover reported deficits.

Pursuant to Section 218.503(2), Florida Statutes, whenever it is determined by a local governmental entity that one or more of the above conditions have occurred or will occur if action is not taken to assist the local governmental entity, the local entity shall notify the Governor and the Legislative Auditing Committee. Upon notification that one or more of the above conditions exist, the Governor or his or his or her designee shall contact the local governmental entity to determine what actions have been taken by the local governmental entity to resolve the condition. The Governor shall determine whether the local governmental entity needs State assistance to resolve the condition. If State assistance is needed, the local governmental entity is considered to be in a state of “financial emergency.”

The Auditor General, after reviewing the audited financial statements of local governmental entities, is responsible for notifying the governor and the Legislative Auditing Committee of any government whose report contains a statement by the independent auditor that the government is in a state of financial emergency.

When the Governor's office has been notified by local government officials or the Auditor General that a jurisdiction is in a state of financial emergency, it is then charged with the responsibility of determining what level of state assistance, if any, is appropriate and needed.

Municipal governments in Florida enjoy broad home-rule powers: they have the responsibility and authority to determine services, set service levels, and provide for the funding of such services. The financial emergencies statute, recognizing this relationship, does not provide for the removal of municipal government responsibility in an identified financial emergency. The state's role, rather, is to ensure that local government's take the appropriate steps to eliminate the financial emergency. It is difficult for the State to step in before problems become emergencies without being accused of imposing on home-rule authority.

The Governor has the authority to implement measures as set forth in ss. 218.50-218.504 to assist the local governmental entity in resolving the financial emergency. Such measures may include, but are not limited to:

- Requiring approval of the local governmental entity's budget.
- Authorizing a state loan to a local governmental entity and providing for its repayment.
- Prohibiting a local governmental entity from issuing bonds, notes, certificates of indebtedness, or any other form of debt until such time as it is no longer subject to this section.
- With the cooperation of local officials, making such inspections and reviews of records, information, reports, and assets of the local governmental entity.
- Consulting with officials and auditors of the local governmental entity and the appropriate state officials regarding any steps necessary to bring the books of account, accounting systems, financial procedures, and reports into compliance with state requirements.
- Providing technical assistance to the local governmental entity.
- Establishing a financial emergency board to oversee the activities of the local governmental entity.

Failure to pay obligations (wages, retirement benefits, debt service, etc.) or to have sufficient reserves to cover a deficit can bring a determination of "financial emergency" under Florida law and bring the municipality under close state scrutiny and control, including the establishment of an Emergency Board to oversee the operations of the locality and to provide assistance.

Emergency Boards are empowered to change local priorities and to change fiscal decisions coming from the local political processes. The imposition of such Boards would likely create a degree of discomfort for local officials.

The Board, in collaboration with the local government develops a plan that must include: (1) provision of payment in full of all payments due or to come due on debt obligations, pension payments, and all payments and charges imposed or mandated by federal and state law and for all judgments and past due accounts, as priority items of expenditure; (2) establishment of a basis for priority budgeting; and (3) the prohibition of a level of operation which can be sustained only with nonrecurring revenues.

The primary emphasis of the Emergency Board process is debt settlement and budgeting. It is not designed or well suited to meet the needs of community economic recovery and redevelopment. While Emergency Board actions usually presume issues of local fiscal mismanagement, it is uncertain at this writing whether the same provisions and priorities would apply after a catastrophic disaster event. In all likelihood, state officials, in the application of financial emergency provisions in a post catastrophic disaster environment, would be highly sensitive to the importance of economic redevelopment as a condition for ultimately satisfying debt obligations.

Because of their taxing authority, municipalities don't go out of business. Unlike corporations, municipalities are not allowed to liquidate their assets to pay off debts. Municipalities usually craft their plans for adjusting their debts by either refinancing or extending debt maturities or reducing the amount of their principal or interest.

Typically municipalities obtain debt financing through two different means: (1) General Obligation Debt backed by the taxing power of the entity; or (2) Revenue Bond Financing involving the dedication of a particular stream of revenues to the municipality's debt service.

Municipal Options

Faced with problems of a similar scope, a private sector entity might well consider bankruptcy among its top options. Some analysts suggest that severely distressed local governments should have the same option. However, the bankruptcy option has been pretty much removed from the table for local governments by state officials concerned about the stigma of bankruptcy and its potential impact on other governmental entities in the state. To date it has been seldom used and is considered an "option of last resort." According to recent articles and reports, there is reason to think thinking may be changing.

Fiscally distressed local governments can turn to a number of options short of default or bankruptcy to put their fiscal house in order. These include:

- cutting expenditures
- raising taxes
- postponing payment of obligations
- drawing down reserves
- renegotiating debt obligations to reduce or defer payments
- borrowing from government entities or commercial lenders.

Some of these solutions available to local governments, such as borrowing, refinancing bonds, or postponing payments on other obligations, provide temporary relief but may increase costs in the long run. For local governments that are experiencing only a temporary disruption in cash flow, these options can provide the needed cover until their normal revenue streams are restored. In the case of a public entity with longer-term problems, short-term fixes may just delay the day of reckoning and compound the problem.

Other remedies, such as raising taxes or cutting services, may actually hinder the municipality's ability to stabilize itself and recover. This would occur where taxes rise or services fall to a level that discourages investment or results in disinvestment. Under those circumstances, the disadvantages of default or bankruptcy must be weighed against the cost of the municipality continuing to meet its obligations. Where the cost to the community's health is too high, bankruptcy may necessarily become an option to consider.

Municipal Bankruptcy: Option of Last Resort?

Dealing with municipal insolvency through Bankruptcy Protection under Chapter 9 has been a seldom used option. Fewer than 500 governments have filed for Chapter 9 protection since the laws were revised in 1937 and most have involved small entities such as irrigation districts. However, there is evidence which suggests the trend may be changing. Catastrophic disasters are but one factor than may necessitate seeking

Chapter 9 protection. In today's changing economic climate some rethinking may be in order.

Municipal bankruptcy under Chapter 9 provides local governments with a means to refinance or reduce debt and to obtain relief from burdensome contracts. It does not wipe the slate clean.

Following are some of the factors that may explain the scarcity of approved filings:

- States, which ultimately must approve the use of municipal bankruptcy, traditionally do not favor bankruptcy because of the stigma of bankruptcy and its potential impact on other governmental entities in the state. (This stems primarily from financial mis-management issues, not unavoidable costs associated with disaster recovery)
- The threshold requirements for municipal bankruptcy are high. The entity must be insolvent, and its state must specifically authorize the filing.
- The municipality is required, as a precondition to filing, to engage in negotiations with its creditors or to be excused from such negotiations for reasons specified in the statute. The negotiations may lead to a resolution of the problem outside of court.
- To meet the requirements for court approval of a bankruptcy, municipalities are required to engage in self-help remedies, such as using their borrowing capacity or raising taxes to the extent practical. Thus, municipal bankruptcy cannot be used to avoid politically unpleasant but reasonable actions.
- Municipalities are not exposed to some of the risks that lead other creditors to seek bankruptcy protection. As mentioned earlier, their assets are not subject to seizure.
- Municipalities, like businesses, are concerned about the ramifications of bankruptcy on their ability to borrow and the cost of borrowings if approved.
- Some of the relief that is theoretically possible, such as abrogating union contracts, may not be achievable as a practical matter, given the requirement for state authorization.
- The process is expensive.

Despite the limitations and possible fall-out from bankruptcy, it can help a municipal debtor in critical ways:

- It provides immediate relief by staying the municipality's obligation to make payments on debt other than special revenue bonds.
- It provides a means of obtaining long-term relief, including reduction in debt and other obligations that will bind a dissenting minority if a majority of creditors consent.
- Bankruptcy can protect a municipality and its residents from untenable levels of taxation

- by blocking creditor lawsuits seeking to force officials to raise taxes to support debt.
- Because post-filing borrowings to support the entity's operations are given a higher priority than pre-filing borrowings, it can in some cases facilitate borrowing.
- It provides immediate relief by staying the municipality's obligation to make payments on debt other than special revenue bonds.
- It provides a means of obtaining long-term relief, including reduction in debt and other obligations that will bind a dissenting minority if a majority of creditors consent.
- Bankruptcy can protect a municipality and its residents from untenable levels of taxation by blocking creditor lawsuits seeking to force officials to raise taxes to support debt.
- Because post-filing borrowings to support the entity's operations are given a higher priority than pre-filing borrowings, it can in some cases facilitate borrowing.
- Under Chapter 9 a municipality retains control over its political and governmental decisions. It is free to spend tax revenues on current expenditures, without regard to past debts. Municipal property is free from attachment and seizure.
- It can provide access to credit to meet its immediate operating needs.

When all other short-term options have been exercised or have failed, it would be useful to have access to the bankruptcy process. Municipal bankruptcy is not a perfect solution for a governmental entity's fiscal problems, but it can provide breathing room while other long-term options are pursued. Local governments must continue functioning, and temporary or partial relief from heavy debt service obligations can make a difference. As the number of municipalities in fiscal distress mount the resistance to bankruptcy option eventually might be relaxed.

A fundamental objective of Chapter 9 should be to provide court protection that allows financially distressed municipalities to continue to provide essential public services to its residents while it develops and negotiates a plan for adjusting its debts. The municipality receives 1) a breathing spell through an automatic stay against the actions of creditors, and 2) the power to adjust its debts through the bankruptcy plan negotiated with creditors.

In order to file for Chapter 9 bankruptcy, a municipal entity must meet a number of statutory requirements. In particular it must:

- Qualify as a municipality
- Obtain state authorization
- Be insolvent and be committed to settling its debt

What constitutes municipal insolvency? Insolvency means the municipality either is not paying its debts or will not be able to pay its debts as they come due. Because municipal assets are not subject to seizure and sale, insolvency of a municipality is not determined

simply by examining its current balance sheet. Determination of a municipality's insolvency requires a comprehensive cash flow analysis of factors including multi-year cash flows, available reserves, ability to reduce expenditures or borrow, and legal opportunities to postpone debt payments. The municipality is expected to continue operating and to provide at least a minimal level of services. A municipality's taxing capacity also enters into the analysis of insolvency. Although a municipality need not exercise its taxing authority to the fullest extent possible before a court can deem it insolvent, a failure to consider any reasonable tax increase may lead a court to conclude that the good faith requirement has not been met.

States can condition the ability of their municipalities to seek Chapter 9 protection. The state may attach preconditions to state authorization provided such requirements do not undercut the efficacy of Chapter 9. According to State Statute 28 local governmental entities may not seek application of laws under the bankruptcy provisions of the United States Constitution except with the prior approval of the Governor.

While retaining its independent objectivity and not necessarily endorsing bankruptcy, the Bureau of Government Research and the Public Affairs Research Council of Louisiana (2006) offered the following observation: "For a devastated community, continuing to shoulder pre-event debt loads and obligations may interfere with its ability to create the conditions needed for recovery. In that context, bankruptcy is a legitimate line of inquiry and should not be ruled out as an option. While its limitations and negative implications must be carefully considered, the drag of outsized debt, reduced services, and elevated tax rates on redevelopment should also be analyzed. It becomes a matter of a hard-nosed cost-benefit analysis."

Municipal Consolidations, Mergers, and Dissolution

Finally, municipalities functionally and economically devastated by disasters might entertain legal reorganizations as a means of providing essential services to residents and businesses and increasing the capacity to resolve otherwise overwhelming fiscal problems. Guidance for such actions is provided in Chapter 165, Florida Statutes.

Typically these reorganizations would take one or more of the following forms:

Consolidation: The combining of two or more municipalities which results in the termination of the existence of each of the municipalities and the creation of a new municipality.

Merger: The combining of two or more municipalities which results in the termination of the existence of all but one, with the surviving municipality absorbing and assuming jurisdiction over the municipalities which have been terminated,

Dissolution: A municipal charter may be revoked and a municipality dissolved either by a special act of the Florida Legislature or by an ordinance approved by the city council and by voters in a referendum subject to the restrictions outlined in Chapter 165, Florida Statutes.

Final Observation: No specific policies and procedures relating to dealing with insolvent municipalities in a post catastrophic disaster environment were found in state or local level literature or statutes during the writing of this PDRP. It would be advantageous for the State to work proactively with the League of Cities and municipalities to develop practical guidance on the subject.

MAJOR POST DISASTER REDEVELOPMENT GOALS AND ISSUES

This section of the plan provides a narrative discussion of the broad issues under which actions found in Volume 1 are structured. The issues are grouped into four major topics: 1) local government recovery issues, 2) economic and private sector issues, 3) social and environmental issues, and 4) redevelopment and mitigation issues. Each topic begins with a goal to guide countywide actions on these issues. During the planning process, the issues in this section were voted on at a public workshop (Part 3) to determine which ones were most important to Palm Beach County. The result was a prioritized list of the ten most important post disaster issues:

1. Availability of Temporary Housing/Long-term Sheltering
2. Rapid Restoration of Power and other Private Utilities
3. Adequate Health and Mental Health Services available during Recovery
4. Including Affordable Housing in Redevelopment Projects
5. Debris Management and Disposal
6. Critical Infrastructure and Facility Repair
7. Sustaining Essential Governmental Services
8. Ability to Rebuild with Stronger Structures
9. Water Pollution from Sewer System Failures
10. Shortage of Contractors/Supplies Slows Repairing of Homes and Businesses

Subsequent to an April 2009 workshop/symposium involving urban planners, economists, housing experts, and emergency management professionals working in the Gulf recovery efforts and 178 public and private sector stakeholders, economic redevelopment emphasizing the use of local resources over outside contractors was added to the list.

Local Government Recovery Issues

GOAL: Rapid, Successful Recovery. The County and other participating jurisdictions and agencies shall strive to provide services in a manner that speeds the ability of residents and businesses to recover from a disaster. Intergovernmental coordination, public-private collaboration, and effective communication will be core methods for achieving this goal.

Availability of Temporary Housing / Long-term Sheltering

The lack of temporary housing or long-term shelters can be a serious issue in a post disaster situation. If people whose homes are uninhabitable have nowhere in the area to return to after a major or catastrophic disaster, then repopulation and resumption of businesses will greatly suffer. The aftermath of Hurricane Katrina is a prime example of

this issue. Inhabitable residential units in New Orleans were in demand and had high price tags attached. Much of the low-income population had to start over in the towns they were evacuated to or where they have friends or family. The current population of New Orleans is a fraction of what it was and employees for businesses were in short supply.

Another major reason for having adequate temporary housing is to minimize the time emergency shelters need to stay operational long after the danger of the storm has passed. In Palm Beach County, public schools double as emergency shelters, and for the schools to reopen, those who have nowhere to go until their homes are repaired or they find new permanent housing will be forced to find other accommodations outside the impact area.

The identification of temporary housing and long-term sheltering requires planning at the local, regional and state level and is not something that should be left up to federal officials alone. As was seen with the “FEMA city” in Charlotte County after Hurricane Charley, simply finding space and running utilities for Federal Emergency Management Agency (FEMA) trailers may not always be the best solution. It can lead to crime and serious depression for those who must live in that situation (Kaufman, 2005). Another issue with relying solely on trailers and other outside assistance after the storm is that temporary solutions may become long-term necessities if reconstruction is slow and lengthy. This has been a problem in Florida, and caused worry in the Gulf Coast, as temporary mobile homes could experience another tropical storm or hurricane. Often, sites for temporary housing eventually become permanent residential areas, and the community may want to designate areas for temporary housing that are compatible with residential uses (Florida Department of Community Affairs, 2006).

In its Temporary Housing Plan for Catastrophic Events, Palm Beach County largely relies on vacant residential structures, such as apartment complexes, condominiums, and motels/hotel rooms, as temporary housing. The county’s 139 mobile home and RV parks are also given high priority because of their existing infrastructure. The plan also identifies a number of vacant parcels throughout the county it deems suitable for sitting trailers and/or tents for temporary housing. These parcels, pared from an original list of 78, were reviewed for access to infrastructure, community needs, and land use suitability. Additional actions can and should be taken to further strengthen the Temporary Housing Plan.

Debris Management and Disposal

Debris removal is generally considered to be one of the first things that must be finalized before recovery and redevelopment can progress. Major disasters, however, can generate massive quantities of debris that will exceed local capabilities to manage and take months to clear and dispose of. Hurricane Andrew, a relatively compact hurricane, generated an unimaginable 43 million cubic yards of disaster debris in Miami-Dade County.

Debris management, especially involving construction and demolition debris easily extends into the long-term recovery and redevelopment period. Palm Beach County

maintains a comprehensive debris management plan which is based on a Category 4 hurricane scenario. Under the plan, Palm Beach County's Engineering Department (PBCENG) will coordinate with and support the Solid Waste Authority in the permanent removal, storage, grinding, and disposal of all disaster-related debris from public property. Private property debris management commonly slows and complicates removal. The disposal of private debris is often seen as a responsibility of local government. However, it can become a contentious issue when dealing with gated communities or private streets since the local government may not be reimbursed for collection there.

Debris clearance from Palm Beach County roadways and PBC public property will be accomplished using a combination of county crews and equipment, mutual aid providers, and private contractor resources. Municipalities are responsible for coordinating the permanent removal, storage, recycling and disposal of all debris within their jurisdictions. The SWA has entered into Interlocal Agreements with municipalities in Palm Beach County to allow for a cooperative effort in the management of disaster debris and securing reimbursement for eligible debris management costs from appropriate federal, state and local agencies.

Countywide critical facility sites that affect public safety have top priority for clearance, whereas private debris is collected later.

Disposal sites, such as landfills or composting areas, can quickly exceed normal capacity during recovery activities. Therefore, the plan divides the county into 12 debris zones, each with a corresponding collection site. For the most part these sites are current or future parks and recreation facilities or landfills. The Florida Department of Environmental Protection regulates these sites and attempts to ensure debris composting and collection does not adversely affect the lands for future uses.

Recycling and separation of debris types must be a focus of debris management as well. By keeping organic debris, such as tree limbs, separate local governments can then turn this into mulch, which can then be offered to citizens for landscaping projects after the storm. In addition, building materials are often mixed in with other debris, but items such as bricks could be salvaged. Finally, hazardous materials such as asbestos should not be mixed in with other debris. Education prior to a storm or immediately after an event is the best way to accomplish debris separation so that more can be recycled and save room in landfills.

Debris accumulation can present its own hazards. These risks can be partially mitigated prior to the disaster event through landscaping regulations and maintenance and building codes that address wind-borne objects. Large piles of organic debris can become public health concerns, providing a haven for rodents and pests. Once dry, debris becomes fuel for urban and wildfires. On conservation or rural lands the accumulation of debris becomes fuel for wildfires, another natural disaster in itself. The cost to collect and dispose of some debris can be defrayed through Public Assistance (PA) grants from FEMA. Debris located on public lands and right-of-ways are eligible, as is debris deemed to be a threat to public health and safety or economic recovery. The

grant requires matching funds from the county up to 25 percent of the cost for contracted or regular staff debris services.

Those involved in long-term recovery and redevelopment are encouraged to familiarize themselves with the County's Debris Management Plan which can be accessed at: <http://www.swa.org/pdf/debrismgmtplan.pdf>.

Critical Infrastructure and Facility Repair

The repair of critical infrastructure and facilities will be paramount to establishing normal operations within communities. Many times major roads, bridges, and facilities such as wastewater treatment plants, as well as other utilities, will be significantly damaged during a disaster event. Often these facilities serve "mission essential" functions within the community and, when not in operation, can debilitate the community's ability to recover. When planning for critical infrastructure and facility repair, local governments should consider how repairs to

these functions will be prioritized. The county's CEMP and Recovery Plan address the need to prioritize infrastructure and facility repairs. Swift and immediate response in restoring these systems is essential to future redevelopment activities. Another component of facilities repair is the designation of alternative locations for essential functions to be carried out while repairs are being made to damaged facilities. This should be covered by each organization's Continuity of Operations Plan (COOP).

Beyond the immediate response duties addressed in the CEMP, the county can incorporate mitigation actions into annual preparations for the hurricane season. Rather than reconstructing the same infrastructure system that was damaged or destroyed by the disaster event, jurisdictions should explore new, innovative designs. Analyzing weak structural links in the systems or reviewing maintenance records that reveal aging systems could expose areas that are susceptible to failure. Where funds are available, these areas could be upgraded pre-disaster. However, when disasters strike before proper mitigation retrofits can be implemented, the county should be prepared with pre-approved new system designs. Preparedness will ensure a quick recovery and one which will promote mitigation against future disaster events.

Fair and Equitable Distribution of Disaster Assistance

The Federal government has stated through law the intent to ensure that all relief and assistance is provided in an equitable and impartial manner (42 USC Ch. 68). Palm Beach is the largest county in Florida by area, with population centers scattered throughout. Distributing disaster assistance equitably will be logistically difficult. The county has separated communities, far inland from the population concentration on the coast. There are also disparities in economic status, which, as was evident in New Orleans, will likely require increased assistance for special needs populations. Citizens who remained in the City were largely lower income residents who lacked personal automobiles needed to evacuate. Likewise, certain demographic segments of Palm Beach County will require a greater amount of assistance in the post disaster period. The perception of inequality can raise tensions in an already tense post disaster

atmosphere. Communication and public involvement in how community assistance funds are used can help alleviate some of this tension.

Sustaining Essential Governmental Services in the Face of a Post Disaster Economic Crisis

Relatively minor disasters like Hurricanes Frances, Jeanne, and Wilma create scattered damages and short-lived, recoverable interruptions to local economies. Catastrophic disasters, on the other hand, cause unprecedented damages, including loss of lives, widespread physical damage, and massive dislocations of residents and businesses. They also cause serious and longer-term disruption to much of the core economic activity that generates the local tax and revenue bases necessary to sustain essential governmental services. Such disruptions, of course, do not relieve local governments from their public service and financial obligations. In fact, these obligations invariably increase in the aftermath of a disaster.

Almost immediately after a catastrophic event, difficult decisions need to be made by local governments as to how to replenish revenue bases or to otherwise compensate for shortfalls. Reserves and insurance are depleted quickly and recovery may take months or years. Redevelopment of a fully sustaining revenue flow can take a very long time. State and federal assistance can help to some degree, but are often too little, too late or come with cumbersome strings attached. Less than two months after Katrina, New Orleans was forced to cut its city staff by 3,000 people (a 50% cut) and to seriously reduce its services while waiting for assistance through FEMA's Community Disaster Loan Program. A large concern with such decreased resources is how to keep the city safe. They have had to resort to calling in the National Guard multiple times to protect those who have remained.

Another obstacle to a local government trying to sustain its essential services is the reduction in county or city credit ratings that a catastrophic disaster can often cause. This can affect the local government's bonding capacity and other financial resources, making recovery even more difficult. Communities are wise to proactively explore other, quickly implementable strategies that may help to relieve financial shortfalls in the near-term until federal help arrives. (Truesdale, public presentation, 19 April 2006)

A more comprehensive description of this topic can be found in Volume 2.

Avoiding Erosion of Local Control with Influx of Federal and State Assistance

After a declared disaster event, and especially one of catastrophic proportions, state and federal agencies move in to assist and, if local capabilities and plans are inadequate, may sometimes need to take over or lead recovery efforts. The very concept of a major disaster is that local capacity to respond is overwhelmed. Local officials, staff, and their families are victims themselves of the disaster event, and help from nearby communities cannot be provided because they are usually impacted as well. A major or catastrophic disaster is also a matter of media and political attention and the Governor and President need to be involved at least symbolically to show support and assure stability (Quarantelli, 2005). While occasionally this sort of outside assistance can create territorial tensions, it is generally welcomed and not questioned. This can become a

problem, however, if some local presence is not integrally involved to guide outsiders on issues specific to the area. It becomes particularly problematic if outside control persists beyond response and immediate recovery phases into redevelopment decisions. New Orleans, with hardly any local staff left due to an inability to pay them, was forced to rely heavily on outside assistance during the early stages of planning recovery and redevelopment. With a plan in place prior to a disaster, Palm Beach County should have a better chance of retaining or regaining control of decisions that have important implications for its future.

FEMA ESF #14, Long-Term Community Recovery, within the NDRF is the federal entity most likely to be mobilized if the County and state request federal assistance. It is the primary arm of the federal government that can arrange for and coordinate a full range of federal agencies in providing technical, operational and financial assistance. It behooves the County to establish a working relationship with ESF #14 and its federal primary and support agencies to understand in advance what will be needed to work productively with them from day one.

Another erosion of local control occurs through financial assistance. Federal and State grants and loans often come with strings attached. Some of these strings may be beneficial and promote mitigation efforts, but there may be instances where the implications of the assistance are not consistent with the needs and wants of local government and the citizenry.

Municipal Insolvency Following a Disaster

As we witnessed in Louisiana and Mississippi, catastrophic disaster events put a tremendous strain on local economies. There, because of the massive areas rendered uninhabitable for extended periods of time, communities experienced a surge in tax delinquencies, bond defaults, bankruptcies and mortgage foreclosures. Unaccustomed to financial emergencies of this magnitude, what do municipalities do when they suddenly become insolvent and the prospects of recovery through traditional revenue sources or tax increases become unlikely?

In Palm Beach County there are 38 municipalities, seven of which have a population of less than 1,000 residents). Many of these incorporated areas are almost entirely residential and their revenue sources would be greatly limited after a disaster. In addition, many of these smaller municipalities might not be capable of offering the services that will be needed during disaster recovery. In such cases the responsibility will likely fall to the county and state to do so.

Because of their taxing authority, municipalities do not go out of business. Unlike corporations, municipalities are not allowed to liquidate their assets to pay off debts. Municipalities usually craft their plans for adjusting their debts by either refinancing, extending debt maturities, or reducing the amount of their principal or interest. Municipalities obtain debt financing through two different means: 1) General Obligation Debt backed by the taxing power of the entity; or 2) Revenue Bond Financing involving the dedication of a particular stream of revenues to the municipality's debt service. These options may be limited if the credit rating of the city plummets after the disaster.

A seldom used option for dealing with municipal insolvency is Bankruptcy Protection under Chapter 9. Fewer than 500 governments have filed for Chapter 9 protection since the laws were revised in 1937. The fundamental objectives of Chapter 9 are providing court protection that allows financially distressed municipalities to continue to provide essential public services to their residents while they develop and negotiate plans for adjusting debts. However, Florida has a stricter set of conditions that it imposes on financially distressed municipalities. Failure to pay obligations (wages, retirement benefits, debt service, etc.) or to have sufficient reserves to cover a deficit can bring a determination of “financial emergency” under Florida law and bring the municipality under close state control, including the establishment of an Emergency Board to oversee the operations of the locality and to provide assistance. (Truesdale, public presentation, 19 April 2006)

Use of Local Business Capabilities in the Disaster Recovery Process

Often, businesses and employees remaining in the impacted area after a disaster event continue to have some level of operational capability, but they usually have to sit idly by while outside volunteers and contractors perform recovery work. Where skills and resources are available and intact locally, it makes little sense to wait for outside businesses to complete recovery tasks or for employees to collect unemployment if they are able and willing to be part of their own community’s rebuilding process. Early use of local private sector resources is a key strategic element in rebooting local economies.

Many area businesses provide goods and services which have direct or indirect relevance to recovery needs. Some may require outside assistance in amassing needed equipment and materials or may need a base facility from which to work. Given the proper information prior to a disaster and a line of communication to those in charge of recovery work, many businesses would be able to speed recovery efforts and at the same time reduce their disruption losses from the event. Those companies who are unable to assist in recovery may have skilled employees who could benefit from recovery work until they are able to return to their jobs. Use of a local labor force may minimize the post disaster skill drains that often occur when workers with marketable skills leave to pursue work outside the impact area. (Truesdale, public presentation, 19 April 2006)

Palm Beach County has established a private public partnership dedicated to private sector initiatives to build a more disaster resilient community and to facilitate community and economic recovery and redevelopment. Among its 50 plus planned initiatives are measures encouraging businesses helping businesses. “The county partnership is party to the formation of a regional partnership which can exploit pre and post disaster business collaboration and mutual aid”.

Economic and Private Sector Issues

GOAL: Economic Vitality, Health and Resilience. Through policy and support of the local business community, Palm Beach County shall work to preserve and restore the industry, agriculture, and tourism bases critical to a sustaining a healthy local economy and supporting a high quality of life for its residents.

Availability and Affordability of Property Insurance

As most homeowners in Florida are well aware, property insurance premiums are increasing substantially as adequate coverage becomes harder to find. Many private insurance companies are not able to insure more homeowners in high risk areas and are having to raise rates because of the increased risk during this era of high hurricane activity. Other companies are actually dropping customers and discontinuing coverage in the state. Many homeowners who cannot find coverage in the private market are turning to the public Citizens Property Insurance Corporation created by Florida Statute 627.351(6). However, Citizens itself is having problems making up for its 2004 \$515 million deficit and the likely deficit from 2005. The Corporation is required by law to reduce its exposure through depopulation of its policies but they are being forced to pay private insurers to pick up some of these. In addition, to deal with the deficit, Citizens is assessing all private homeowners' insurers working in the state, which in turn place a surcharge on policy premiums to recoup the assessed amount. This is causing a further financial burden for property owners, even those who are not in high hazard areas. (Insurance Information Institute, 2006)

The Florida Hurricane Catastrophe Fund, a state-run reinsurance pool for high hurricane damage losses, is also running into trouble. Member insurance companies pay premiums into the pool and when losses reach a set trigger level companies pay a deductible to get reinsurance funds. Building construction shortages caused claims to be higher than expected for the past couple hurricane seasons, and the legislature passed changes to the fund in 2005 to lower the trigger level for insurers due to the burden of subsequent storms. These issues, along with massive losses from the 2004 and 2005 hurricanes, have caused the Fund to run out of money. To try to solve this problem, the Legislature increased the bonding capacity of the Fund; however, the bonds are paid for through assessments on insurers in the state, which pass the cost on to their policyholders. (Insurance Information Institute, 2006)

While local governments have no direct control over state and private property insurance, these policies have a direct impact on how disaster-resilient and affordable the county can expect to become. Palm Beach County should keep abreast of legislative intentions for property insurance and make itself heard through local legislators and lobbying organizations such as the League of Cities.

Ability of Small Businesses to Stay Afloat until Adequate Financial Assistance is Available

Business interruptions and failures stemming from disaster events deal a severe blow to local economies in terms of lost productivity and employment. Research from a variety of sources, including the U.S Department of Labor Statistics, consistently reports that 50% to 70% of businesses either never reopen after a major disaster or fail after reopening. Small businesses are represented disproportionately higher among the business casualties. In Palm Beach County, approximately 80% of businesses have fewer than 10 employees (Truesdale, 2006).

The reasons for post disaster business failures are numerous and complex. The extent of damage to critical production and service capacity, inventory, and capital assets are some factors. Other factors involve the amount of financial resources a business can quickly obtain for recovery; these usually include insurance, reserves, and loans. Time is especially critical to small businesses. Even short periods without cash flow can be damaging. Prolonged interruptions waiting for insurance settlements and loan approvals can be catastrophic. Too often small businesses waste valuable time applying for Small Business Administration (SBA) loans only to be turned down or approved too late. Almost a third of SBA applications are turned down and another 10% are still pending months after applications are submitted. Most businesses receive only a portion of what they apply for. Studies indicate the median percentage of business losses covered by approved loans was about 50%. A major problem involves collateral requirements when homes and workplaces have been damaged or destroyed. Service businesses that rent and have few tangible assets also are at a disadvantage. (Truesdale, public presentation, 19 April 2006).

Small business owners, in a rush to reopen and get back to normal, often fail to consider other business options such as reinventing their business or establishing a new business that better suits the changed post disaster business environment (Alesch & Holly, 2002). This can be especially true for the tourism industry. After a disaster, it may be some time before tourists return to the area in the same numbers that proved profitable before. (Truesdale, public presentation, 19 April 2006)

In the event of a disaster, the Governor of Florida has the option to activate the Emergency Bridge Loan Program by Executive Order. The purpose of the Emergency Bridge Loan Program is to provide a source of expedient cash flow to Florida small businesses impacted by a disaster. These short-term, interest-free working capital loans are intended to "bridge the gap" between the time a major catastrophe hits and when a business has secured longer term recovery resources, such as sufficient profits from a revived business, receipt of payments on insurance claims or federal disaster assistance. The program provides a short-term loan of State of Florida public funds, not a grant, with the expectation that repayment will be made out of receipts from other sources of longer term disaster recovery assistance.

Loan terms are as follows:

Amount: Between \$1,000 and \$25,000.

Term: Maximum of 12 months.

Interest: Loans will be interest-free for the loan term.

Payments: Payments are not required during the established loan term, but loans must be paid in full by end of the loan term.

A number of state and federal assistance programs may become available following a disaster. These are described in the assistance section. Finally the county and regional private-public partnerships are pursuing a number of business helping business assistance initiatives to offer small businesses.

Avoiding Permanent Relocations of Core Businesses Outside of the Community

As exemplified by Hurricane Andrew, September 11th, and Hurricane Katrina, virtually all major disasters are accompanied by business relocations, some temporary, but many permanent. These losses can be devastating to local economies. Replacement of key businesses can be extremely time consuming, costly, and difficult. And, such occurrences often permanently change the social and economic chemistry of the community.

The effects of post disaster relocations on the Gulf region are not fully understood at this point. New York City suffered an estimated 138,000 displaced jobs after September 11th. It is not clear how much coordination occurred between the public and private sectors regarding these relocations from New York City. Businesses often took care of themselves or relied on the good will and generosity of others in the private sector. For a variety of reasons, many businesses have no plans or intentions of returning to the City. Today, New York City laments the loss of businesses and is still dealing with the economic void. (Truesdale, public presentation, 19 April 2006)

Regardless of size and financial health, businesses face significant challenges including the inability to operate, lost customers or markets, employee issues, cost concerns, and the grim prospects for business resumption and long-term recovery. Faced with unusable buildings and equipment, damaged infrastructure, extended outages of critical services, displaced or victimized employees, and accessibility issues, businesses are faced with critical and time sensitive decisions to make.

Concerted efforts need to be made by community leaders to retain core businesses and to support their recovery. Planning and preparation need to occur well before a disaster strikes in order to accomplish this. Incentives and the availability of temporary workspace and temporary housing for employees may be factors that determine whether a business can stay or leave after a disaster. Workforce development efforts can also entice a company to remain in the area by assuring them that efforts are being made to retain skilled workers and train others. Assistance with business continuity planning before a disaster can also be an effective strategy. (Truesdale, public presentation, 19 April 2006)

Shortage of Contractors/Supplies Slows Repairing of Homes and Businesses

The high demand for supplies needed to do repair work and the shortages of contractors result in a sharp rise in prices for services and material after a disaster strikes. This can be localized, but in an era of increased hurricane activity, storm damage in one section of the country will divert supplies from other locales. For example, the Gulf Coast area

continues to rebuild in the wake of Katrina and Rita, causing construction material prices to soar throughout the country (Christie, 2005). The increases in construction prices also affect the overall real estate market and can negatively impact the availability of affordable homes.

Contractors are stretched thin during a post disaster period. In addition to construction activities, residents seek repair estimates from contractors before accepting their insurance claim settlement. The high demand for estimates and construction tasks translates into long delays before either estimates are provided or work crews are available. In addition to the post disaster demand for building materials, the United States has experienced a surge in construction over the last several years that further reduce available supplies (Insurance Information Institute, 2006). The delays in supplies and contractor services for repairing structures can be very exasperating for residents and business owners who are trying to return their lives and businesses to normal. Many people also become frustrated when they cannot get their building repaired but see new construction resuming after a disaster. Long delays in repairing damaged homes and businesses also put inhabitants of these structures at risk from mold-related illnesses and/or from increased vulnerability to wildfires as embers can more easily enter a structure with damaged eaves or siding (Florida Division of Forestry, 2005). The market should begin to correct for the shortages in supplies as more contractors and suppliers begin to understand the increase in hurricane activity. Incentives for contractors to do small repair jobs before resuming large construction contracts after a major hurricane should be explored as well as increasing contractor classes and offering expedited post disaster training addressing Florida-specific building regulations for out of state contractors coming in to help.

Rapid Restoration of Electrical Power and other Private Utilities

As anyone who has lived in Palm Beach County during hurricane season knows, recovery from a hurricane really cannot begin until major utilities, especially electricity, are restored. Simply trying to get somewhere in the county can be difficult when most traffic signals are out and curfews due to dark and dangerous streets are a constant reminder to residents of their inability to return to normal daily life. Power and telecommunication outages keep most businesses from operating and result in large disruption costs that business owners must absorb. Telephone and cell phone service disruptions also are a problem during recovery. Water and sewer failures also slow recovery.

In 2004, four hurricanes disrupted power supplies in 62 Florida counties. Telecommunication systems were also affected by hurricane forces. Approximately 18,000 utility crew members were called in from around the Southeast, in accordance with mutual aid agreements. Still, the repair process required more than 2 weeks to complete. Floridians were asked to be patient as the late summer heat made conditions nearly unbearable (Florida Department of Environmental Protection, 2004). More recently, Hurricane Wilma caused power outages to 3.2 million of Florida Power and Light's (FPL) 4.3 million customer accounts. It was the largest outage in company history and required almost 19,000 workers and several weeks to restore power to all customers. (Swartz, 2005) The good news is that through all of the practice at restoring

power, FPL and other utilities have learned some lessons and are working to not only restore utilities quicker but also communicate with the public as they are doing so. They are also hardening their systems to weather future disasters.

Pressures to rapidly restore utilities discourage or complicate system improvements, often requiring utility providers to rebuild systems with essentially the same designs that were in place prior to a disaster. The need to service customers almost always trumps mitigation. However, long-term recovery in uninhabitable areas may provide important windows of opportunity for mitigation. Investment in pre-disaster mitigation by utilities remains a critical element in enhancing recovery.

Agricultural Losses from Hurricane Damage or Lake Okeechobee Dike Breach

With an estimated \$988 million in total agricultural sales for 2008-09, Palm Beach County leads the State of Florida, all counties east of the Mississippi River, and it's one of the ten largest in the United States. Palm Beach County leads the nation in the production of sugarcane, fresh sweet corn, and sweet bell peppers. It leads the State in the production of rice, lettuce, radishes, Chinese vegetables, specialty leaf, and celery.

In 2010-11, the 459,865 acres dedicated to agriculture represent 36% of the total land mass in the county. Palm Beach County is third in the state in nursery production. It leads the state in agricultural wages and salary with over \$341 million.

According to recent land use analysis, 16,298 acres of the unincorporated agricultural lands are located in flood zones; all of the acres are subject to high winds from hurricanes (Florida Department of Community Affairs, 2006). The incessant rains associated with tropical storms and hurricanes can cause severe flood damage to crops.

Flooding caused by a major failure in the Herbert Hoover Dike would have catastrophic economic consequences for farmers, their employees, and the local economy, perhaps even impacting the national food supply. While little can be done to prevent such agricultural losses, besides ongoing efforts to strengthen the dike, the government can assist by ensuring agricultural recovery is treated as a high recovery priority and fully leveraging financial assistance programs for farmers and the workers who will be essential to rebuilding the industry. Small farm operations cannot be overlooked.

Social and Environmental Issues

GOAL: Social Justice and Environmental Restoration. Palm Beach County shall promote social equity and environmental quality in all post disaster recovery and redevelopment. Prevention of degradation will be the aim.

Reducing the Incidence of Fraudulent and Unethical Practices

Unfortunately, some people see a disaster as an opportunity to make money; usually at the expense of victims. Fraud is rampant after a disaster, from internet scams misrepresenting the collection of donations to volunteers stealing donated items as seen recently in the Katrina Red Cross scandal (CBS News, 2006). Price gouging is also a

common occurrence, although the State of Florida passed a law after Hurricane Andrew prohibiting price gouging after a declared disaster and set up a hotline for reporting any occurrences (Florida Attorney General's Office, n.d.). There also are problems with unlicensed contractors taking people's money without finishing the job or doing shoddy work. The State issues badges to insurance adjusters to prevent hurricane victims from being taken advantage of by imposters (Insurance Information Institute, 2006). The insurance companies, FEMA, and the Red Cross are often the victims of fraudulent claims. These activities have the potential to negatively impact true disaster victims because some forms of assistance may be used up before they can be helped or the procedures for claiming assistance must become more rigorous. This could keep some people from being able to obtain assistance as quickly, or at all. This also creates more desperate disaster victims who may fall prey to predatory lenders as they try to make ends meet financially.

Another unethical practice involves the real estate market. Speculators often pounce on an impacted coastline and offer quick money to devastated homeowners who either do not understand the true value of their property after a disaster or are so upset from the situation that they hastily wish to move far away to somewhere that seems safer (Musgrave, 2004). This is especially an issue for low-income and/or minority coastal communities. There is a constant pressure of gentrification in these areas even before a disaster but many of the residents are unwilling to sell because their family has always lived there or because of the sense of community they find there. After a disaster, left with very few possessions and perhaps unemployed, some see no choice but to sell. This was prevalent in the Gulf Coast in places such as Biloxi, where working class bungalow neighborhoods along the coast quickly disappeared (Apuzzo, 2005). The area is losing historic and unique neighborhoods, while a majority of the residents are not receiving fair compensation for their properties. Education prior to a disaster and available assistance after a disaster is needed in all these instances. Post disaster outreach centers and hotlines can be important in advising people on their options and perhaps preventing decisions that will be regretted later.

Individual's Role in Preparing for and Recovering from a Disaster

A recent buzz phrase introduced by the White House surrounding public disaster awareness is "culture of preparedness." The *Federal Lessons Learned Report* recognized that "A Culture of Preparedness must build a sense of shared responsibility among individuals, communities, the private sector, NGOs, faith-based groups, and Federal, State, and local governments." "Individuals must play a central role in preparing themselves and their families for emergencies (The White House, n.d.)."

If individuals are more prepared before a disaster strikes, the recovery process can be accelerated. Simple things, such as preparing a survival kit with a 10 day or more food and water supply, having a family evacuation or shelter plan, and businesses preparing continuity plans, could result in a less chaotic response period and allow government leaders and emergency managers to begin recovery efforts sooner. In addition, individuals or businesses could speed recovery if they had savings or emergency funds that could be used to make repairs or to acquire temporary or new permanent accommodations until assistance or insurance payments are received. On the federal

level the feasibility of creating tax-free personal disaster savings accounts is being discussed. (Insurance Information Institute, 2006) This would allow assistance to be targeted for those more in need that lacks the financial ability to possess insurance or savings prior to a disaster event.

Adequate Health and Mental Health Services Available During Recovery

Local health and mental health facilities and services may be compromised and not be readily available following a disaster event. However, these services are especially critical and present an immediate need following a disaster. It has been documented that most hurricane-related deaths and injuries actually occur after the storm has passed during cleanup activities. There are numerous public health concerns in the post-disaster environment, including unsafe drinking water, carbon monoxide poisoning from improper operation of generators, lack of access to medications, and contaminated food supplies, among others. Unfortunately, there will likely be fewer health professionals to handle these issues and the increased occurrence of injuries. Securing assistance of doctors and nurses from hospitals or clinics in unaffected jurisdictions of the state will be vital to providing health services. (Hurricane-related Information for Health care Professional, n.d.)

Counseling is always a major need after a disaster as people try to cope with their losses. Cases of depression and domestic abuse are often much higher after a disaster. Drugs and alcohol are sometimes employed as a means to handle stress and trauma, opening the door for possible abuse. Mental health workers are rarely sought out by disaster victims as daily recovery and clean-up tasks take top priority. Assistance needs to be offered within the community. and services need to be tailored to best serve the citizens. The county can explore the outreach potential of national organizations, such as the American Psychological Association to bolster counseling shortages.

Restoring Educational, Cultural, and Historic Institutions and Amenities

Palm Beach County has an abundance of educational, cultural and historic amenities that contribute to its quality of life and attraction as place to live, work and visit. Many, if not all of these prized, often irreplaceable, assets are at risk from disasters.

Educational institutions should be among the top priorities for restoration. Palm Beach County has ten institutions of higher learning; Palm Beach Community College, Florida Atlantic University, and Palm Beach Atlantic University being the largest. Damage and closures of colleges and universities in the Gulf Coast area presented significant recovery problems, including enrollment, economic and research losses following Katrina.

The County boasts being the “Cultural Capital of Florida” and the place where “Culture has Found its Place in the Sun.” Rich with more than 300 cultural venues, including renowned museums, art centers, centers for the performing arts, sports, nature and recreational venues and amenities, it is also ripe for suffering potentially significant economic and tourism losses if they are not preserved and redeveloped.

Historic downtowns, neighborhoods and museums, also abundant throughout the county, once destroyed, would be lost forever.



If these amenities are overlooked during long-term recovery efforts repopulation of the area and resumption of tourism will greatly suffer.

Coastal and Aquatic Restoration

Coastal erosion, a constant and familiar occurrence in Palm Beach County, is exacerbated by storm-caused disasters. Average annual erosion rates along the Atlantic shoreline range from 2 to 3 feet. This is a larger concern for barrier islands, which absorb the brunt of wave energy and experience increased erosive processes. The Florida Department of Environmental Protection categorizes all shorelines in Palm Beach County as “critical” when addressing erosion problems. Coastal storms and hurricanes can change the shoreline dramatically in a short period of time. In addition to sand erosion, coastal storms can also strip away protected mangroves and cut swaths through productive wetlands. Again, barrier islands are highly susceptible to erosion, as storm surge pushes sand beyond the dune system in a process sometimes referred to as the island “rolling over itself”. Sand over wash is problematic for coastal land owners because it can inundate properties and increase vulnerability by removing the beach as a defensive barrier (Beatley, et. al, 2002). Damaged coastal wetlands and mangroves can also increase the vulnerability of coastal development and increase erosion. Storms can also scour the sea floor causing damage to already endangered coral reefs.

In Florida, the Coastal Construction Control Line (CCCL) is intended to prevent development seaward of the extent of erosion caused by a 100-year storm. It is currently being readdressed by the State to determine if the line needs to be moved. Hardening practices, such as engineered jetties, groins, and seawalls, only exacerbate the problem, trading short-term protection for increased erosion rates in the long term (Beatley, et al, 2002). Nourishment projects are the most commonly used method to counter natural erosion. The Palm Beach County Department of Environmental Resources Management has project designs approved by the Florida Department of Environmental Protection for nourishment, dune restoration, and stabilization. They also have pre-approved upland sand sources that can be used as soon as possible after a storm for these projects (D. Bates, personal communication, June 22, 2006). These preparations for responding to erosion are essential but after a disaster, the possibility of larger setbacks or land acquisition should also be considered as a longer-term solution in areas of severe erosion. Whereas, impacted wetlands and mangrove stands may require widespread re-planting projects for shore stabilization.

Adaptation to the Consequences of Sea Level Rise and Climate Change

Palm Beach County and its partners in the Southeast Florida Regional Climate Change Compact have recently launched an organized, collaborative effort to research and discuss the developing threats of climate change and sea level rise on the county and region and to begin developing adaptation strategies and action plans to minimize or mitigate future impacts. Several sections throughout this PDRP provide detailed descriptions of the findings and actions to date and adaptation strategies.

Water Pollution from Sewer System Failures

Sewer system failures in the aftermath of a major disaster are commonly attributed to pump station electrical outages. In areas of little relief and flat topography, pump stations are needed to move waste to the treatment plants. Another concern during a hurricane event is wastewater outflow. When a treatment plant exceeds capacity with inordinate amounts of storm water inflow, intake lines overflow into surface water bodies. In each case, inability to treat wastewater will result in the pollution of natural resources and warnings to avoid water bodies for economic and recreational purposes. The contaminants typically include bacteria, nitrates, metals, trace quantities of toxic materials, and salts. These contaminants can destroy productive aquatic habitats. Humans also must avoid contaminated waters, as bacteria can spread disease from the ingestion of microorganisms such as *E. coli*, *Giardia*, *Cryptosporidium*, and Hepatitis A (Oregon State University Extension Service, 1997). In Palm Beach County, where tourism is a major part of the economy, contaminated waters can result in beach closures and fishing prohibitions. Such orders can last days or weeks depending on the severity and quantity of the contamination. Of particular concern are low-income individuals who often fish for their meals in county waterways. Addressing weaknesses in the systems prior to a disaster and using generators or other means to prevent water pollution is, of course, ideal. When pollution does occur after a disaster, rapidly identifying the source and stopping it are the main courses of action in addition to notifying the public and monitoring the situation.

Increased Fuels for Wildfires on Conservation Lands

Palm Beach County has been more vulnerable to wildfires in recent years because of hurricane debris that has not been cleared out of natural areas and vacant properties. The 2004 and 2005 hurricane season resulted in widespread destruction to vegetation throughout the county. On many conservation and vacant lands, these downed trees have since dried out and become dangerous wildfire fuels. Man-made debris, which accumulates in the forest lands, can contain toxic materials and increase fire intensity. The tangled debris in area forests also create “ladder fuels” which enable a forest fire to climb from the ground level to the tree crowns where it becomes much more intense and difficult to suppress as embers can be blown farther. Where trees have been toppled, removing the crowns, ground-level wind speeds increase, resulting in rapid rates of fire spread. (Florida Division of Forestry, 2005)

The hurricane debris also hinders suppression by Division of Forestry and local firefighters. One of the main wildfire suppression strategies is to create fire lines using tractors to contain the fire. The size of the downed trees and the way they have become piled on the ground make it difficult to plow a fire line and navigating through the debris slows down the process. These obstacles can also be a safety hazard for fire fighters retreating from a blaze. While wildfires are always a concern in Palm Beach County forests, the large increases in dry fuels have greatly increased the vulnerability of area homes. (Yunas, public presentation, 22 March 2006) To deal with the increased risk of wildfire that can occur after a hurricane, prior planning, education, and a coordinated strategy to reduce the added wildfire fuels are recommended strategies.

Unhealthy Levels of Mold in Damaged Structures

Post disaster mold problems have become an increased concern following recent disasters. Mold growth often starts in homes that have been flooded or have structural leaks caused by wind damage. New Orleans was a worst case scenario for mold contamination. Up to 80% of residential structures sustained severe flood damage. (Centers for Disease Control and Prevention, 2005) Extended flooding and the delay in cleanup after the flood waters had receded resulted in such high levels of mold that many structures had to be demolished or completely gutted. A study done in Central Florida after the 2004 hurricane season found 38% of structures tested to be contaminated with the *Stachybotrys* mold genus which is associated with high water damage and produces dangerous mycotoxins (Cortes, 2005). Most Palm Beach County mold situations have been caused by unaddressed post hurricane roof leaks, although inland flooding is also a factor. The poor and elderly seem to be most affected.

There are many species of mold that can cause respiratory infection and immunosuppressed people have a higher risk of infection. More commonly, mold can cause allergic reactions and hypersensitivity. It is assumed that higher levels of mold and longer exposure will result in more illness but at this time there is no standardized method to measure mold exposure and there are no defined safety levels for specific mold species. (Centers for Disease Control and Prevention, 2005) It is generally recommended that all visible mold should be cleaned from inside structures using proper protective gear and that certified professionals should be used to clean extensive mold damage. Property owners must be careful of mold remediation scams, however. Representative Domino from West Palm Beach introduced a bill in 2005 and again in 2006 to the Florida House to require mold remediation professionals to be certified as many other states have already done. Palm Beach County can work to educate homeowners and employers of the health risk for anyone exposed to mold for extended periods. Renters and employees can also be empowered through education so that they do not impair their health due to the negligence of the property owner. Preventing mold from getting a foothold in a structure is the best solution and can be accomplished through education in addition to speeding repairs to structures.

Redevelopment and Mitigation Issues

GOAL: Disaster Resilience. Palm Beach County shall endeavor to redevelop in a sustainable manner by institutionalizing hazard resilience and mitigation. Public participation and the efficient use of public funds will be standard features of redevelopment.

Ability to Rebuild Stronger Structures

Recent hurricane impacts highlight the value of stronger building codes since most of the severely damaged structures were built prior to introduction of post Hurricane Andrew standards and practices. After Andrew, the insurance industry created the Institute for Business and Home Safety (IBHS) which has been educating people on mitigation techniques and studying ways to further enhance structures' ability to withstand hurricane force winds (Insurance Information Institute, 2006). Also, the State legislature adopted a statewide Florida Building Code (FBC), which recognized the

threat of hurricanes and the need to harden structures against such events. Broward and Miami-Dade Counties operate under a slightly different code, including a higher wind load standard than Palm Beach County follows. Given the predicted increase in occurrence and intensity of hurricanes in the coming decade, the county would be wise to consider raising its wind load standards to a comparable level.

Although the county is unable to independently alter the code, as new advances in construction take place, Palm Beach County and its municipalities can encourage the legislature to increase the stringency of the FBC. The county analyzes areas impacted by storm events to record the effectiveness of the FBC versus those structures erected prior to adoption of the more stringent code (R. Caldwell, personal communication, May 11, 2006). This program should be continued and its findings used to justify the need to assist homeowners of substandard housing. Policy guides what level of damage to a structure warrants bringing a structure up to current codes. Currently the FBC and Palm Beach County's Comprehensive Plan (Coastal Management Element Policy 2.5-b) require a structure that is damaged 50% or more of its value be brought up to code during repairs (Palm Beach County, 2005). An incentive for voluntary strengthening of structures beyond code is another way the county could build in disaster resilience. Model homes for the IBHS Fortified for Safer Living program cost from 4% to 9% more to build, but surveys show that on average people are prepared to pay up to 6% more for a disaster-resistant dwelling (Insurance Information Institute, 2006). However, the current real estate market in Palm Beach County makes any increase in housing costs another hurdle to those seeking affordable housing. Education on the benefits of stronger building codes should be a priority during reconstruction efforts. The FBC will be required of new and rebuilt structures, but education programs can motivate homeowners to take the next step toward disaster resilience.

Ensuring Strong Code Enforcement

After Hurricane Andrew, questions were raised as to why there was so much destruction when South Florida had some of the strongest building codes in the country. A Dade County Grand Jury determined that lax code enforcement was a major culprit. Experts estimated that between 25% and 40% of the losses were avoidable. (Insurance Information Institute, 2006)

Since Andrew, the Insurance Service Office has developed a building code effectiveness rating for local governments which takes into account such things as the building code enforcement budget and the qualifications of building inspectors. This Building Code Effectiveness Grading Schedule (BCEGS) is then taken into consideration in determining property insurance rates. (Insurance Information Institute, 2006) In the rush to rebuild, there is always the possibility that lax code enforcement could again come into play and could hinder efforts at disaster resilience. The BCEGS grade is only reevaluated every five years by the Insurance Service Office. To make sure standards do not slip between grading and in the busy rebuilding phase after a disaster, the County and municipalities could require internal reports to the commission or council annually along with specialized training for code enforcement officers on mitigation issues. It is also important to make sure that non-local inspectors who may be brought in to assist after a disaster through a mutual aid agreement are as well trained in the FBC and as

stringent as local inspectors. In addition, making sure only certified contractors who are also trained in the FBC and the latest mitigation techniques are employed in the county will assist the county in achieving disaster resilience.

Communicating with and Involving the Public in Recovery and Redevelopment Issues

“At no time is the opportunity for public involvement in decision making greater than when a community is faced with the practical problems of recovering from a disaster (Natural Hazards Center, 2001).”

Redevelopment after a disaster opens up many opportunities to change problems that existed in the community before the disaster as well as simply rebuilding. Citizens must be involved in these important decisions if the community wants to better itself and avoid a disenfranchised citizenry in the future. “Public buy-in is essential to avoid making decisions in the immediate aftermath of a disaster that may compromise what the community might achieve in the long term (Natural Hazards Center, 2001).” A participatory approach to making redevelopment decisions is not easy, however, and will require time and resources. Also, if the public is going to be asked for their input, there should be an actual desire to use the input in the plans and not simply disregard it. Community involvement is not feasible in the immediate recovery stage after a disaster due to communication, mobility, displacement, and basic needs constraints. The media and community outreach centers, though, can be used to advertise the intent to involve the public in decisions once recovery is further along. Simply keeping the public updated on what decisions have or have not yet been made will promote involvement. Also, awareness programs prior to the storm can make citizens aware of the recovery timeline that may occur after the storm.

In the Gulf Coast, community-based recovery and outreach centers have been created through assistance from non-governmental organizations to try to receive input and educate citizens on recovery efforts. Poor communities have been the targeted audiences for these outreach centers. Also, due to so many residents still being displaced far from their cities and homes, efforts have been made to involve these people as well (Oxfam America, n.d.). Recovery outreach centers and alternative means of communicating with displaced persons must be considered should Palm Beach County ever experience a disaster as well. A visioning process guide found in the Appendix section of Volume 3, goes into more detail as to how the public can be included in planning redevelopment.

Limiting Redevelopment in Hazardous Areas

Decisions on locations of allowable redevelopment will set the stage for future disaster events. In this regard, post disaster redevelopment is the connection to the community’s mitigation efforts. Citizen demands can create political pressures to allow a complete recreation of that which was destroyed. Allowing complete reconstruction can ease the administrative hassles that typically accompany limitations on development, such as moratoria or increased setbacks. However, allowing wholesale redevelopment foregoes the opportunity to reassess the hazard exposure and vulnerability of commercial and residential areas, as well as the locations of public infrastructure. Other missed opportunities include, implementing mitigation initiatives, increasing public safety, and fulfilling a previously formulated vision for community

redevelopment (FDCA, 2006). Allowing redevelopment in areas that have been destroyed without including enhanced mitigation, or at least assessments, puts the burden of paying for future disasters on taxpayers who have to assume some of the response and recovery costs from those hazardous development decisions. New Orleans had heated battles over allowing redevelopment everywhere, as Mayor Nagin promised his constituents, or creating smart land use patterns to replace development in extreme hazard areas with green space as an advisory committee suggested (Roberts, 2006). Attempting to establishing and implementing policies limiting redevelopment in hazardous areas prior to a disaster can be politically volatile. However, post disaster these decisions may be unavoidable. Public education and consideration of policy options prior to a disaster may help to lessen public and political pressures when an event occurs and allow for more rational and disaster resilient choices. Public participation in redevelopment decisions is key and can be carried out through a visioning process during the post disaster recovery period. The Florida Department of Community Affairs is prepared to assist with expedited review of land use amendments, allowing the county to act quickly during redevelopment. Securing funding for strategic land acquisition after a disaster is also essential.

Including Mitigation in Rebuilding

After a disaster, there may be a rush to rebuild as people wish to return to some sense of normalcy. Often in this rush, they pass on opportunities to include hazard mitigation so that the same destruction does not happen again. During this period of increased extreme events, it is imperative that people begin to realize the benefit of mitigating the problem rather than just rebuilding exactly as before. Education and financial assistance are essential to incorporating mitigation into rebuilding. Many people may not be aware of simple or cost-effective mitigation techniques that could be included as they repair their homes and businesses. Others may be aware of mitigation solutions but do not feel they have the financial means to include them. Addressing these gaps is both a pre disaster and post disaster concern. The Local Mitigation Strategy program is the county's preferred mechanism for developing and delivering education campaigns for hazard mitigation prior to a disaster. It is after a disaster, however, when a homeowner already has to make repairs or rebuild, that they may be more receptive to undertaking mitigation projects. Reaching these people quickly before they begin rebuilding is necessary and could be done by providing education material and experts to answer questions at recovery outreach centers and local hardware stores. Also, education of contractors so that they inform property owners of mitigation techniques that could be used, is a good outreach method. Offering grants, loans or other incentives to address the added cost of mitigation is another way to encourage inclusion of mitigation during redevelopment. Combining mitigation with investments in energy saving systems and features that can help offset mitigation costs can be an attractive option for property owners to consider.

Including Affordable Housing in Redevelopment Projects

Until the recent housing crisis and economic recession, Palm Beach County had experienced a chronic shortage of affordable, workforce housing. For many years the county has supported a very ambitious workforce housing program designed to ensure an adequate supply of available affordable housing. While the current economic

environment has created a sudden glut of low cost housing, a major disaster event will likely wipe out much of this base of affordable structures. In general, these houses are more susceptible to damage than most because they tend to be older, substandard in terms of current codes, or are mobile/manufactured structures. Affordable residences are disproportionately damaged during hurricanes. Consequently, the need for affordable housing becomes even more acute after a disaster and can lead to socioeconomic crisis if not dealt with proactively and quickly. To make matters worse, workforce housing is especially important for firefighters, police, teachers, service workers and other members of the general workforce who will play key roles in rebuilding the community. A lack of available affordable housing could greatly jeopardize the ability of a service intensive community such as Palm Beach County to retain workers and to bounce back after a major disaster.

Palm Beach County developed a vision for its land use planning efforts years ago that has revolved around maintaining a diverse community that includes urban and rural communities and all levels of income households. To maintain that vision after a disaster will mean that affordable housing continues as a community priority both pre and post disaster.

Disaster-Resilient Public Funding Decisions

The public expenditure of funds on capital improvements (e.g., roads, wastewater treatment and other public facilities) in hazard areas can encourage and facilitate growth, and thus increase the population exposed in hazard areas. Repairing existing infrastructure that supports development in hazardous areas spreads the burden of paying for possibly repetitive repairs due to hazard damage to all of the taxpayers and subsidizes those who choose to live in the hazardous area. These public funding decisions impair the ability of the county to become more disaster-resilient and are not efficient uses of public money. Of course, in most cases repairs must be made to infrastructure damaged by a hurricane simply because the development already exists and services cannot be denied to those residents. Subsidizing those who live in the hazard area may be optional, however. Special taxing districts could be created for areas with recurring funding needs for hazard damage. Also, after a disaster outside assistance from the state or federal government may be available to make it feasible for the local government to make a more disaster resilient choice. Outside money may be available to undertake projects that were previously considered infeasible financially, such as elevating a damage-prone road, relocating a police station, or flood-proofing a sewage treatment plant (Natural Hazards Center, 2005). Having a current assessment of at-risk public facilities, mitigation options and/or potential alternative locations for each might make post disaster decisions about how to use funding in a more disaster resilient fashion more feasible.

OBSERVATIONS/GUIDANCE ON KEY RECOVERY ISSUES

This section provides detailed discussions and guidance on select key topic issues relevant to post disaster long-term recovery in Palm Beach County. In addition to information adapted from the 2006 PDRP, it also incorporates largely verbatim descriptions, analysis and guidance on key topic issues offered in the state's *Post-*

Disaster Redevelopment Planning: A Guide for Florida Communities. Information has been edited and tailored to be consistent with the Palm Beach County's organizational capabilities, concept of operation and post disaster redevelopment program and plan.

The issues have been classified using Department of Community Affairs's suggested phasing typology:

Phase 1 - actions that should be undertaken at a minimum in the initial phase of recovery and redevelopment. Indicated with a prefix as **(1)**

Phase 2 - actions that should be undertaken as soon as resources are available (simultaneously with Priority 1 actions or in the subsequent planning phase). Indicated as **(2)**

Phase 3 - actions that should be addressed as soon as a solid foundation for recovery and mitigation can be established. Indicated as **(3)**

Following is a summary listing of the key issues selected for discussion, with their phased classifications. The balance of the section provides detailed description of each topic issue.

Government Recovery Issues

- (1)** Sustaining essential government services in the face of economic crisis
- (1)** Potential threat of municipal insolvency
- (1)** Fair and equitable distribution of disaster assistance
- (2)** Avoiding erosion of local control with the influx of federal/state assistance

Infrastructure and Public Facilities

- (1)** Rapid restoration of power and other private utilities
- (1)** Infrastructure for temporary recovery operations
- (1)** Debris management
- (1)** Financing infrastructure and public facilities repair
- (2)** Infrastructure and public facilities mitigation and historic considerations
- (3)** Relocation of vulnerable infrastructure and public facilities
- (3)** Regional infrastructure consideration
- (3)** Enhanced infrastructure capacity to priority redevelopment areas

Land Use

- (1)** Phased reconstruction and streamlined permitting
- (1)** Build back standards for nonconforming and substantially damaged structures
- (2)** Controlling long-term post-disaster blight
- (2)** Reducing disaster vulnerability through voluntary mitigation programs
- (3)** Prioritizing areas to focus redevelopment
- (3)** Historic preservation and restoration

Housing

- (1)** Availability of temporary housing/long-term sheltering

- (1) Temporary housing siting criteria, provision, and removal
- (1) Ability to reconstruct homes rapidly
- (2) Transitioning residents back to permanent housing
- (3) Rebuilding affordable housing
- (3) Encouraging homeowners to incorporate mitigation during rebuilding

Economic Redevelopment

- (1) Resumption and retention of major employers
- (1) Small business assistance
- (1) Preferential use of local/regional business capabilities and workers in recovery
- (2) Workforce retention
- (2) Tourism renewal
- (3) Physical economic redevelopment projects
- (3) Agricultural losses from hurricane damage or dike breach
- (3) Opportunities to sustainably restore economic vitality

Health and Social Services

- (1) Health facility restoration
- (1) Social services to socioeconomic vulnerable populations
- (1) Re-establish public safety service levels
- (1) Public safety service levels re-established throughout the community
- (1) Coordination and assistance for non-governmental organizations and volunteers
- (1) Provide for special needs populations throughout long-term redevelopment
- (1) Public transportation restoration and improvement
- (2) Reopening schools
- (2) Behavioral health assistance
- (2) Medical personnel retention and recruitment
- (3) Reducing Incidence of fraudulent and unethical practices
- (3) Health-related pollution and environmental justice
- (3) Quality of life factors
- (3) Preserving the county's rich culture and heritage
- (3) Restoring institutions of higher education

Environmental Preservation and Restoration

- (1) Beach and dune restoration
- (1) Environmental contamination
- (1) Environmental and historical review of temporary sites
- (2) Natural land and habitat restoration
- (3) Green rebuilding
- (3) Parks and urban forest restoration

Local Government Recovery Priorities

Local government has the primary role of planning and managing all aspects of the community's recovery. Individuals, families and businesses look to their local government to articulate recovery plans and needs. Plans should include a *Continuity of*

Government (COG) and Continuity of Operations (COOP) elements. If local government becomes overwhelmed, it may need to request and secure backup staffing, recovery expertise, leadership or other forms of assistance.

State and Federal officials are available to assist and support development and implementation of local recovery plans and activities within their charters when needed and requested. The majority of mitigation measures are adopted, codified and enforced at the local level through the Local Mitigation Steering Committee. It is up to local government officials to ensure State and Federal standards relating to recovery are adopted and to enforce them. Examples include participation in the *National Flood Insurance Program (NFIP)* and enforcing building codes.

Leadership in preparing hazard mitigation and recovery plans, raising hazard awareness and educating the public on available tools and resources to enhance future resilience (e.g., Chapter 7 of the *Americans with Disabilities Act (A D A) Best Practices Tool Kit*, concerning emergency preparedness and people with disabilities) is also a responsibility of local government. Finally, county and municipal governments, as employers, need to oversee implementation of plans to ensure employees are protected and assisted during emergencies. Seizing opportunities to share public information on the recovery process, status and plans is important to maintaining community coordination and focus.

Representative agencies and organizations that will play a major role include:

Federal/State/Regional Agencies and Organizations

- FEMA (including FEMA (ESF #14)
- Federal Assistance Agencies
- Florida Division of Emergency Management
- Florida Department of Economic Opportunity
- Regional Metropolitan Planning Organizations (TCRPC)
- Florida Department of Financial Management & Budget
- Florida Department of Financial Services

Local Government Departments

- Board of County Commissioners/City Councils
- County Administration/City Managers
- League of Cities
- County and Municipal Departments
- Department of Public Safety/Division of Emergency Management
- PDRP Executive Committee/Working Groups
- Legislative and public Affairs

Other Organizations

- Treasure Coast Regional Planning Council

Among the post disaster responsibilities of local governments are such things as:

- Organize, develop, implement and modify recovery, mitigation and land use plans as needed.

- Ensure integrated efforts across government offices, the private sector and nongovernmental organizations (NGOs) during the formulation and implementation phase of recovery projects and activities, including raising and leveraging recovery funds.
- Lead efforts to restore and revitalize all sectors of the community, including local critical infrastructure and essential services, business retention and the redevelopment of housing units damaged, disrupted or destroyed by the disaster.
- Manage rebuilding so that risk reduction opportunities are optimized and comply with standards for accessible design.
- Communicate and coordinate with other levels of government involved in recovery.
- Establish metrics to evaluate and communicate progress and the achievement of local disaster recovery objectives to all populations.

Following are key issues that will be faced by the County and municipal governments:

Sustaining Essential Government Services in the Face of Economic Crisis (1)

Catastrophic disasters cause serious and long-term disruptions to much of the core economic activity necessary to sustain essential governmental services. Unfortunately, such disruptions do not relieve local governments of their public service and financial obligations. In fact, these obligations will increase significantly in the aftermath of the event. With tax bases in disarray and reserves and insurance sapped or depleted, local governments must meet the three-fold challenge of, continuing to provide services, rebuilding damaged infrastructure, and servicing existing debt.

Almost immediately after a catastrophic event and well into the recovery period, difficult decisions need to be made by the county and each local government as to how to replenish revenue bases or to otherwise compensate for shortfalls. With reserves and insurance depleted, recovery may take months or years. Redevelopment of a fully sustaining revenue flow can take a very long time. As with Andrew, Katrina and other catastrophic events, the economic landscape may never be the same and economic redevelopment may resemble a patchwork quilt.

The unexpected loss of revenue due to catastrophic disaster damage, coupled with the increased financial burden of humanitarian relief, reconstruction and economic redevelopment will almost certainly require local governments to turn to state and federal government for financial assistance.

The Potential Threat of Municipal Insolvency (1)

By virtue of their size, limited reserves, and limited revenue sources, many Palm Beach County municipalities, unless well insured, will likely have difficulty weathering the economic impacts of extreme disaster events on their own. What do municipalities do when they suddenly become insolvent and the prospects of recovery through traditional revenue sources or tax increases have been blown away?

What constitutes municipal insolvency? Insolvency means the municipality is either is not paying its debts or will not be able to pay its debts as they come due. Because

municipal assets are not subject to seizure and sale, insolvency of a municipality is not determined simply by examining its current balance sheet. Determination of a municipality's insolvency requires a comprehensive cash flow analysis of factors including multi-year cash flows, available reserves, ability to reduce expenditures or borrow, and legal opportunities to postpone debt payments. The municipality is expected to continue operating and to provide at least a minimal level of services. A municipality's taxing capacity also enters into the analysis of insolvency. Although a municipality need not exercise its taxing authority to the fullest extent possible before a court can deem it insolvent, a failure to consider any reasonable tax increase may lead a court to conclude that the good faith requirement has not been met.

When the Governor's office has been notified by local government officials or the Auditor General that a jurisdiction is in a state of financial emergency, it is then charged with the responsibility of determining what level of state assistance, if any, is appropriate and needed.

Distressed local governments can turn to a number of options short of default or bankruptcy to put their fiscal house in order. These include:

- cutting expenditures
- raising taxes
- postponing payment of obligations
- drawing down reserves
- renegotiating debt obligations to reduce or defer payments
- borrowing from government entities or commercial lenders.

Some of these solutions available to local governments, such as borrowing, refinancing bonds, or postponing payments on other obligations, provide temporary relief but may increase costs in the long run. For local governments that are experiencing only a temporary disruption in cash flow, these options can provide the needed cover until their normal revenue streams are restored. In the case of a public entity with longer-term problems, short-term fixes may just delay the day of reckoning and compound the problem.

Other remedies, such as raising taxes or cutting services, may actually hinder the municipality's ability to stabilize itself and recover. This would occur where taxes rise or services fall to a level that discourages investment or results in disinvestment. Under those circumstances, the disadvantages of default or bankruptcy must be weighed against the cost of the municipality continuing to meet its obligations. Where the cost to the community's health is too high, bankruptcy may necessarily become an option to consider.

Fair and Equitable Distribution of Disaster Assistance (1)

By law the Federal government and thus state and local government are charged with ensuring that all relief and assistance is provided in an equitable and impartial manner (42 USC Ch. 68).

Nevertheless several recent disasters, including the World Trade Center attack and Katrina, have led government officials, public health agencies and emergency planners to conclude that further improvement in national, state and local emergency planning and response and recovery practices are needed to ensure equitable access to disaster assistance.

Palm Beach County is the largest county in Florida by area, with widely dispersed population centers of varying sizes and makeup. Distributing disaster assistance equitably will be logistically difficult and an administrative challenge, particularly with regard to some of the more geographically isolated communities and open space areas and special needs populations. There are significant disparities in economic status, as was evident in New Orleans following Katrina, which will necessitate increased and/or specialized assistance for special needs populations. Certain demographic segments, especially low income, non-English speaking, the elderly and physically handicapped, will require greater attention and assistance in the post disaster period.

The perception of inequality can raise tensions in an already tense post disaster atmosphere. Communication and public involvement in how community assistance funds are used can help alleviate some of this tension.

Avoiding Erosion of Local Control with Influx of Federal and State Assistance (1)

After a declared disaster event, and especially one of catastrophic proportions, state and federal agencies move in to assist and, if local capabilities and plans are inadequate, may sometimes need to take over or lead recovery efforts. The very concept of a major disaster is that local capacity to respond is overwhelmed. Local officials, staff, and their families are victims themselves of the disaster event, and help from nearby communities cannot be provided because they are usually impacted as well. A major or catastrophic disaster is also a matter of media and political attention and the Governor and President need to be involved at least symbolically to show support and assure stability (Quarantelli, 2005). While occasionally this sort of outside assistance can create territorial tensions, it is generally welcomed and not questioned. This can become a problem, however, if some local presence is not integrally involved to guide outsiders on issues specific to the area. It becomes particularly problematic if outside control persists beyond response and immediate recovery phases into redevelopment decisions. New Orleans, with hardly any local staff left due to an inability to pay them, was forced to rely heavily on outside assistance during the early stages of planning recovery and redevelopment. With a plan in place prior to a disaster, Palm Beach County should have a better chance of retaining or regaining control of decisions that have important implications for its future.

FEMA ESF #14, Long-Term Community Recovery, is the federal entity most likely to be mobilized if the County and state request federal assistance. It is the primary arm of the federal government that can arrange for and coordinate a full range of federal agencies in providing technical, operational and financial assistance. It behooves the County to establish a working relationship with ESF #14 and its federal primary and support agencies to understand in advance what will be needed to work productively with them from day one.



Infrastructure and Public Facilities

Restoration of infrastructure and critical public facilities after a disaster is a prerequisite for recovery –one that is addressed in local government and private utility and infrastructure companies’ emergency response and short-term recovery plans. There are long-term redevelopment considerations for infrastructure restoration, however, that must be weighed in conjunction with land use, environment, housing, and economic redevelopment issues. Taking advantage of opportunities to upgrade, mitigate, or even relocate infrastructure or public facilities after a disaster should be addressed. Advanced planning allows a community to make deliberate decisions about redevelopment that they may otherwise have had less opportunity to do during the post-disaster rush to rebuild. Decisions about infrastructure reconstruction will influence private redevelopment decisions, and using disaster repairs as an opportunity to include hazard mitigation allows a local government to lead by example.

There are many agencies, jurisdictions, and stakeholders involved in providing infrastructure, public facilities, and utility services. Before and after a disaster, these private and public entities need to establish communication and coordination procedures to ensure that long-term recovery and redevelopment occurs in an efficient and organized manner. Each agency or company should have its own recovery plan; however, if any opportunities for directing redevelopment are to be pursued then coordination and communication are critical.

Representative agencies and organizations that will play a major role include:

State/Regional Agencies and Organizations

- Florida Department of Transportation
- Florida Division of Emergency Management
- Regional Metropolitan Planning Organizations

Local Government Departments

- Environmental Protection
- Facility Management
- Historic Preservation
- Parks and Recreation
- Public works
- Solid waste/ Sewer/water Resources
- Transportation

Rapid Restoration of Power and other Private Utilities (1)

As anyone who lived in Palm Beach County during the 2004 and 2005 hurricanes can attest, recovery cannot begin in earnest until major utilities, especially electricity, are restored. Simply trying to get somewhere in the county can be difficult when most traffic signals are out and curfews due to dark and dangerous streets are a constant reminder to residents of their inability to return to normal daily life. Power and telecommunication outages keep most businesses from operating and result in large disruption costs that business owners must absorb. Telephone and cell phone service disruptions also are a problem during recovery. Water and sewer failures also slow recovery.

In 2004, four hurricanes disrupted power supplies in 62 Florida counties. Telecommunication systems were also affected by hurricane forces. Approximately 18,000 utility crew members were called in from around the Southeast, in accordance with mutual aid agreements. Still, the repair process required more than 2 weeks to complete. Floridians were asked to be patient as the late summer heat made conditions nearly unbearable (Florida Department of Environmental Protection, 2004). More recently, Hurricane Wilma caused power outages to 3.2 million of Florida Power and Light's (FPL) 4.3 million customer accounts. It was the largest outage in company history and required almost 19,000 workers and several weeks to restore power to all customers. (Swartz, 2005) The good news is that through all of the practice at restoring power, FPL and other utilities have learned some lessons and are working to not only restore utilities quicker but also communicate with the public as they are doing so. They are also hardening their systems to weather future disasters.

Pressures to rapidly restore utilities discourage or complicate system improvements, often requiring utility providers to rebuild systems with essentially the same designs that were in place prior to a disaster. The need to service customers almost always trumps mitigation. However, long-term recovery in uninhabitable areas may provide important windows of opportunity for mitigation. Investment in pre-disaster mitigation by utilities remains a critical element in enhancing recovery.

Infrastructure for Temporary Recovery Operations (1)

After a disaster, temporary recovery needs for infrastructure arise, particularly related to temporary housing. The long-term implications of temporary recovery operations are often related to the precedent set by providing infrastructure to a location. For instance, a temporary housing group site that is placed in a greenfield outside of the jurisdiction's urban service area could easily lead to public pressure to develop the area since it is demonstrated that infrastructure can be extended and the site has already been cleared and given transportation access. Using infrastructure in a temporary manner is wasteful when the expense of placing that infrastructure could have been spent on placing or enhancing infrastructure capacity to a site encouraged for permanent development. local government utilities and public works staff can collaborate with emergency managers to come up with creative ways that temporary recovery operations could be preplanned in a way that would also benefit community capital investment goals. The need for flexibility and to use property that is available to meet unique post-disaster demands will require that this sort of collaboration happen on an annual basis to

brainstorm scenarios for creative, temporary infrastructure reuse depending on current opportunities.

Debris Management (1)

Debris removal is one of the first things that must be finalized before recovery and redevelopment can progress. Major disasters, however, can generate massive quantities of debris that will exceed local capabilities to manage and take months to clear and dispose of. Hurricane Andrew, a relatively compact hurricane, generated an unimaginable 43 million cubic yards of disaster debris in Miami-Dade County.

Debris management, especially involving construction and demolition debris easily extends into the long-term recovery and redevelopment period. Palm Beach County maintains a comprehensive debris management plan which is based on a Category 4 hurricane scenario. Under the plan, Palm Beach County's Engineering Department (PBCENG) will coordinate with and support the Solid Waste Authority in the permanent removal, storage, grinding, and disposal of all disaster-related debris from public property. Private property debris management commonly slows and complicates removal. The disposal of private debris is often seen as a responsibility of local government. However, it can become a contentious issue when dealing with gated communities or private streets since the local government may not be reimbursed for collection there.

Debris clearance from PBC roadways and PBC public property will be accomplished using a combination of county crews and equipment, mutual aid providers, and private contractor resources. Municipalities are responsible for coordinating the permanent removal, storage, recycling and disposal of all debris within their jurisdictions. The SWA has entered into Interlocal Agreements with municipalities in Palm Beach County to allow for a cooperative effort in the management of disaster debris and securing reimbursement for eligible debris management costs from appropriate federal, state and local agencies.

Countywide critical facility sites that affect public safety have top priority for clearance, whereas private debris is collected later.

Disposal sites, such as landfills or composting areas, can quickly exceed normal capacity during recovery activities. Therefore, the plan divides the county into 12 debris zones, each with a corresponding collection site. For the most part these sites are current or future parks and recreation facilities or landfills. The Florida Department of Environmental Protection regulates these sites and attempts to ensure debris composting and collection does not adversely affect the lands for future uses.

Recycling and separation of debris types must be a focus of debris management as well. By keeping organic debris, such as tree limbs, separate local governments can then turn this into mulch, which can then be offered to citizens for landscaping projects after the storm. In addition, building materials are often mixed in with other debris, but items such as bricks could be salvaged. Finally, hazardous materials such as asbestos should not be mixed in with other debris. Education prior to a storm or immediately after an event is the best way to accomplish debris separation so that more can be recycled and save room in landfills.

Debris accumulation can present its own hazards. These risks can be partially mitigated prior to the disaster event through landscaping regulations and maintenance and building codes that address wind-borne objects. Large piles of organic debris can become public health concerns, providing a haven for rodents and pests. Once dry, debris becomes fuel for urban and wildfires.

On conservation or rural lands the accumulation of debris becomes fuel for wildfires, another natural disaster in itself. The cost to collect and dispose of some debris can be defrayed through Public Assistance (PA) grants from FEMA. Debris located on public lands and right-of-ways are eligible, as is debris deemed to be a threat to public health and safety or economic recovery. The grant requires matching funds from the county up to 25 percent of the cost for contracted or regular staff debris services.

Debris will need to be properly disposed of to prevent long-term impacts. Depending on the type of debris being handled, precautions have to be taken to limit soil and water contamination as well as air pollution. Debris that contains chemical contaminants will require separate processing and disposal. Coastal and waterway debris can pose a threat to plant and animal species, block water channels, and disrupt navigational operations. Landfill capacity is often limited, and incineration is not always an option due to emissions standards and the potential for air pollution. Debris removal should ensure that environmental areas do not suffer from prolonged exposure to pollutants, and clean-up procedures should consider sensitive environmental areas to minimize additional impacts. where practical and appropriate, debris may be processed through a recycling and reuse program. Engineering and the Solid Waste Authority have a comprehensive state-of-the-art debris management plan.

Those involved in long-term recovery and redevelopment are encouraged to familiarize themselves with the County's Debris Management Plan which can be accessed at: <http://www.swa.org/pdf/debrismgmtplan.pdf>

Financing Infrastructure and Public Facilities Repair (1)

When the county starts to make decisions about which structures to relocate after a disaster or which mitigation projects it should invest in pre-disaster, it needs to consider funding availability. Knowing where to prioritize spending requires some basic knowledge of what is covered under insurance policies, which projects will be eligible for Federal reimbursement through the Public Assistance Program, which projects can be funded through grant programs, and if there are financial reserves that can be targeted for grant matching funds or local investment. When the county begins to address its infrastructure issues as part of the initial planning process or as a pre-disaster implementation action, it should launch an assessment of county or municipal insurance policies to determine which facilities are covered and for what extent of damage. They can then use this assessment to make decisions about increasing coverage or financing repairs to uninsured structures. They can also determine whether mitigation enhancements would be covered under current policies and Public Assistance or whether additional funding, such as HMGP, would be needed. The assessment should be updated periodically

Use of Public Assistance for Improved/Alternate Projects

County applicants may determine that improvements should be made while restoring a damaged facility or that the public would not be best served by restoring a damaged facility or its function at all. FEMA refers to these projects respectively as improved and alternate. Public Assistance possibly might be granted to approved projects such as:

Alternate Projects

- Repair or expansion of other public facilities;
- Construction of new public facilities;
- Purchase of capital equipment
- Funding of hazard mitigation measures in the area affected by the disaster.

Possible Improved Projects

- Relocation of public facilities;
- Using improved materials;
- Capacity expansion
- Rebuilding to higher codes and standards

Infrastructure and Public Facilities Mitigation (1)

Impacted communities can capitalize on opportunities post-disaster to mitigate damaged infrastructure and public facilities so that they are more resilient to future disasters. With pre-planning, mitigation can be included during repairs or rebuilding of the facility. If it is a critical infrastructure or facility that must be rapidly restored, the repairs can be done with the knowledge that they are going to be temporary until a more comprehensive rebuild can be done. For less critical facilities that are priorities for mitigation, the potential for delaying restoration in order to include mitigation should be considered in coordination with any plans for phasing private redevelopment as discussed in the Land Use section.

There are several funding sources available for infrastructure mitigation depending on the specific project the community is pursuing. FEMA's Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) Program can both provide assistance to conduct infrastructure retrofitting, as long as, 1) the project's end result is to protect and mitigate public/private property from natural hazards, and 2) there is a clear cause and effect relationship between the natural hazard and the damage. Infrastructure retrofit projects include measures that reduce risk to existing utility systems, roads and bridges.

Relocation of Vulnerable Infrastructure and Public Facilities (3)

In order to prevent repetitive damage to infrastructure and public facilities, consideration should be given to relocating severely damaged infrastructure to less vulnerable areas instead of rebuilding in the same location. Relocating infrastructure may also serve community goals to direct development away from vulnerable locations such as the Coastal High Hazard Area. While relocation decisions ultimately will need to be made after a disaster, communities are encouraged to develop standards or criteria

pre-disaster in order to assist in making post-disaster decisions about which facilities should be relocated based on factors such as damage, cost, and location. Preliminary plans for new facilities can even be drafted pre-disaster to speed relocation in the event of a disaster. Local government staff can also prepare for relocation opportunities by being aware of eligible funding requirements. A community could also consider investing in relocation projects for vulnerable facilities identified in the planning process before a disaster instead of funding major renovation or maintenance projects for those facilities.

Regional Infrastructure Considerations (3)

After a major disaster, smaller communities will be dependent on the ability of larger communities that are home to regional infrastructure systems to recover quickly and efficiently before they can recover. The speed of restoration for facilities, such as international airports and seaports, and infrastructure, such as bridges and truck routes, in neighboring jurisdictions can greatly impact the timing of your community's recovery. In addition, some communities will become host to long-term evacuees from neighboring jurisdictions, which may require increased infrastructure capacity. A best practice for post-disaster redevelopment planning is to coordinate regionally; this is especially important for infrastructure and public facility recovery.

The FEMA-sponsored Florida Catastrophic Planning Initiative may be a resource for understanding and integrating regional planning on infrastructure and facility restoration into long-term recovery plans.

Enhanced Infrastructure Capacity to Priority Redevelopment Areas (3)

Assuming sustainable Priority Redevelopment Areas have been identified, advanced planning for equipping these areas with the infrastructure necessary to support targeted redevelopment after a major disaster will probably be important to the strategy's success. Priority Redevelopment Areas may require new infrastructure service or enhanced capacity if the intensity or density of development is to be increased to accommodate the transfer of population and businesses from more hazardous areas of the community (or neighboring communities) to sustainable redevelopment areas. Communities may be able to enhance or mitigate infrastructure and facilities in Priority Redevelopment Areas with post-disaster funding and waive impact fees as an incentive for residents and businesses to relocate to sustainable areas.

Land Use

Land use is the most central topic to address in the Plan. Post-disaster redevelopment can provide communities the opportunity to change previous development decisions that may no longer be desired, leap forward in implementing its vision for the future, and become more resilient to disasters by avoiding or mitigating development in hazardous locations. Waiting until after a disaster to make land use decisions, the community may not be able to take advantage of these opportunities. On the other hand, making detailed decisions on where and what to rebuild before a disaster occurs is not always practical since the specific areas that actually become a so-called "clean slate" for

redevelopment may not be the same as the pre-disaster projections. Implementing changes in land use after a disaster also must recognize private property rights and the financial burden that disaster survivors may face if required to rebuild to a higher standard. The land use actions of the PDRP should establish a flexible strategy for redeveloping in a way consistent with the comprehensive plan and in a manner that will increase the resiliency of the community to future disasters.

Representative agencies and organizations that will play a major role include:

State/Regional Agencies and Organizations

- Florida Department of Economic Opportunity
- Florida Department of State, Division of Historical Resources
- Regional Planning Councils

Local Government Departments

- Building and Code Enforcement
- Hazard Mitigation/Floodplain Management
- Historic Preservation
- Legal
- Parks, Recreation, and Natural Resource Management
- Planning/Growth Management/Community Development
- Zoning/Permitting

Other Organizations

- Community Redevelopment Associations
- Environmental Preservation Organizations
- Historic Preservation Organizations
- Local Mitigation Strategy working Group/Committee
- Property Rights or Developer Associations

Phased Reconstruction and Streamlined Permitting (1)

An established provision for a phased post disaster temporary permit suspension (aka building moratorium) or other temporary restrictions on processing development orders is a vital tool for a local government after a major disaster. Temporarily modifying the local permitting process can provide for rapid disaster repairs while maintaining a reasonable amount of time for permitting officials and property owners to assess the situation and make smart redevelopment decisions. If there are no procedures in place for differentiating between the types of permit applications and when they will be processed, local government staff could be overwhelmed and the critical permits that need to be processed for recovery to advance could be delayed. It is very important to establish temporary post-disaster permitting procedures during “blue skies” so that public outreach can be conducted to ensure there are no misconceptions.

Moratoria should be phased based on the level of damage and/or the location so that structures or areas with light to moderate damage can quickly proceed with necessary repairs while those with severe damages can consider options for rebuilding to different standards or relocating. For instance, a developed barrier island could be designated to

have a longer, temporary moratorium on building permit applications than less hazardous areas of the jurisdiction to allow the necessary time for infrastructure to be repaired and opportunities for hazard mitigation to be explored. Another option is to base the moratorium on the degree of damage to the individual structure. Hillsborough County Ordinance 93-20, for example, provides for an initial moratorium of 72 hours in the case of a disaster declaration, which is then followed by moratoria for destroyed structures (30 days), major damaged structures (10 days), minor damaged structures (4 days), and new development (30 days).

Build Back Standards for Nonconforming and Substantially Damaged Structures (1)

Nonconforming and substantial damage policies generally state that a structure must be rebuilt to current adopted standards once it meets a certain damage threshold. Requiring post-disaster rebuilding to meet current safety codes and floodplain regulations is essential to building a more disaster-resilient community, but other standards might not be as necessary and could be a burden to disaster recovery efforts. Many communities require different aesthetic standards and other non-essential requirements, such as yard setbacks or commercial building design, in their land development regulations that a substantially damaged structure may be required to meet depending on the community's build back policy.

Nonconforming uses could also be forced to conform after a disaster depending on the community's policies. It is often unclear what standards a community will enforce concerning nonconformities when rebuilding after a disaster and, in some cases, there may be conflicting standards among community plans. A review of policies and codes is recommended so that hard choices between what is fair to disaster survivors and moving the community further down the road to its vision for the future can be decided pre-disaster. Whatever is decided, it is important that build-back standards are clearly understood before a disaster occurs to ensure that they are enforced and do not become a matter that delays the redevelopment process.

Jim Schwab, senior research associate with the American Planning Association and principal author of *Planning for Post-Disaster Recovery and Reconstruction* (1998) has offered the following opinion regarding compromising for nonconforming issues: "In the aftermath of a disaster, it is both politically and practically unlikely that the community will want to take an uncompromising stand against allowing the repair and reconstruction of all nonconforming uses. Disasters may pose an opportunity to eliminate nonconforming uses or even reshape existing patterns of development along lines deemed more desirable, but they also generate enormous pressures from property owners to allow the re-establishment of the existing development pattern, complete with nonconforming buildings and uses... Under such circumstances, the community may need to face the question of where and how to compromise and for what reasons. Establishing clear criteria for allowing the re-establishment of nonconforming uses under disaster-related circumstances is recommended."

Controlling Long-Term Post-Disaster Blight (2)

After a major disaster, some residents may choose to not return to their homes or lack the necessary funds to repair them and many damaged commercial spaces may remain damaged and vacant as tenants go out of business or relocate to better locations and newer buildings – resulting in sporadic blight throughout the community. This could lead to weakness in investor confidence as well as public safety concerns and the inability of area residents to feel a return to normalcy. Blight abatement after a major disaster could be beyond the capability of traditional local code enforcement procedures. The county should review its protocols for the demolition of destroyed structures for opportunities to streamline the process so that unsafe, blighted structures do not remain in neighborhoods for unacceptable timeframes. Consideration should also be given to alternative methods for demolition cost reimbursement since the typical method of property liens may not be adequate to maintain demolition operations if condemnations are widespread and extended beyond Federal reimbursement program timeframes. Pre-disaster public awareness as well as outreach early on in post-disaster recovery will be integral to successful blight removal timelines. A key issue in dealing with blight is also ensuring that the abandoned property is made available to those who can and will rebuild it. Local government attorneys will need to determine the best way of streamlining the acquisition and reselling of adjudicated blight properties after a disaster.

Reducing Disaster Vulnerability Through Voluntary Mitigation Programs (2)

Community resilience to future disasters can be greatly increased by taking advantage of post disaster opportunities to build back differently in high hazard locations. This can be accomplished through regulations or through voluntary programs, such as acquisition, transfer of development rights, and mitigation incentives, thereby avoiding concern over private property rights infringement. A major opportunity to reduce vulnerability may result from hazard mitigation grant funding for land acquisition of highly vulnerable of damaged properties after a disaster or even pre-disaster. These properties can be used to further efforts of environmental restoration or public recreation as well. Similar results can be obtained by establishing a transfer of development rights program that includes criteria for decreasing development rights in hazardous locations by transferring them to more sustainable areas. A key issue that all coastal communities must deal with in post disaster redevelopment planning, however, is the difficult paradox that the most valuable real estate is also the most hazardous area of the community (Godschalk, 1985). The ability of coastal communities to make major increases in disaster resilience is limited by a strategy that only utilizes acquisition or transfer of development rights due to the high costs of compensating coastal property owners and the difficulty in finding willing sellers.

Another method of reducing vulnerability is to offer incentives for structural hazard mitigation during reconstruction. For each hazard, there is a multitude of proven building techniques that can mitigate disaster damages but are typically not required during repairs or reconstruction. Post-disaster monetary incentives in addition to education is a recommended strategy if you intend to encourage enough property owners to voluntarily rebuild to a higher standard such that it results in a discernible

reduction in your community's vulnerability. This type of strategy would be an ideal crossover initiative between the LMS and Post-Disaster Redevelopment Plan, using the LMS as the tool for obtaining funding and for a pre-disaster education campaign while the PDRP lays out the strategy for preparing and implementing the post-disaster actions.

Prioritizing Areas to Focus Redevelopment (3)

Limited time, funds, and materials are going to make simultaneous redevelopment of all damaged areas difficult. County communities may want to encourage redevelopment in areas that correspond to their vision for the future and those less vulnerable to disasters by prioritizing and incentivizing development in these areas. The best way to build resiliency to disasters is to direct future development to safe locations while minimizing or mitigating highly vulnerable types of development in hazardous areas. After a disaster, targeted sustainable redevelopment areas can provide immediate opportunities for redevelopment since they will have sustained less damage and can be prioritized for infrastructure restoration and expedited permitting. Allowing for rapid redevelopment in safe areas intended for increased future development can provide time to minimize vulnerable redevelopment or plan the sustainable reconstruction of areas severely impacted from the disaster. Designated priority recovery and redevelopment areas can also provide opportunities to locate temporary post disaster uses more efficiently and consistent with future land uses.



Hillsborough County's Typology for Priority Redevelopment Areas

A Priority Redevelopment Area (PRA) is a regional or community center or a critical installation essential for disaster recovery and consistent with future land use plans. Priority Redevelopment Areas will receive focused and prioritized attention during the short-term recovery and long-term redevelopment periods and will serve one or more of the following redevelopment functions:

1. Rapidly restore centers of economic activity and critical facilities,
2. Provide a staging area for restoring nearby impacted communities,
3. locate recovery services in efficient and convenient hubs, and
4. Facilitate growth into disaster resilient centers.

Sustainable Priority Redevelopment Areas are areas that can be sustainably redeveloped to a higher intensity than current conditions and are a focus of future land use plans for the jurisdiction. These areas are consistent with regional visions for economic development and public transit. Most importantly, they meet the following resilience criteria:

1. Not in a floodplain or include minimal flood-prone property that can be addressed through best practice hazard mitigation techniques.
2. Not vulnerable to storm surge from a tropical storm or Category 1-3 hurricane (outside Category 3 evacuation zone).
3. Include a substantial amount of structures that meet current Florida Building Code standards and would be less likely to have severe wind damage.
4. Include infrastructure and services that have been assessed for their ability to be rapidly repaired and restored.

Vulnerable Priority Redevelopment Areas contain essential location-dependent facilities, are well-established community centers integral to economic recovery and returning to normalcy, and/or are planned growth areas critical to regional visions for the future. Vulnerable PRAs, as the name implies, are more vulnerable to severe disaster damage than the Sustainable PRAs due to location and/or lack of resiliency factors. These areas may take longer to recover than Sustainable Priority Redevelopment Areas because damages will most likely be more severe. It is the intention that any area designated as a Vulnerable Priority Redevelopment Areas will also be a priority for pre- and post disaster hazard mitigation investments to build disaster resilience and enable future redevelopment of these Priority Redevelopment Areas to be even more rapid after a disaster. The emphasis on Vulnerable PRAs will be to function as recovery hubs and restore economic vitality, not necessarily to facilitate increases in density from redevelopment.

Historic Preservation and Restoration (3)

The loss of historic resources due to a disaster can have a major impact on the community. Some losses may be unavoidable, but others could occur accidentally during recovery operations if procedures are not in place to watch for these concerns. Details on developing expedited historic preservation review procedures and restoration tools and considerations are included in the guidebook Disaster Planning for Florida's Historic Resources (see Resources section for more information). Historic structures can be particularly vulnerable to damage due to their age, and repair of these structures must meet certain requirements to maintain their character and historic designation. Due to considerations for historical integrity, historic structures have more options for meeting Florida Building Code standards during repair than non-historical buildings. There may also be funding opportunities before or after a disaster for implementing mitigation measures to prevent further damages to historic resources. Engagement of local historic preservation organizations into the planning and implementation process can ensure that the unique considerations involved with

preserving and restoring historic structures and archeological sites are included in planned actions.

The Florida Division of Historical Resources has identified common concerns regarding post disaster historical preservation, including:

- Restorable buildings being torn down.
- Irreplaceable architectural elements that could be salvaged being carted away with debris.
- Property owners making hasty decisions and inappropriate repairs.
- Archaeological resources being disturbed by heavy equipment.
- Construction applications overburdening officials; e.g., insufficient staff to carefully review all the applications.
- Inspections being done by persons lacking qualifications for preservation of historic resources.

Housing

After a disaster, one of the most basic foundations of community recovery is the timely provision of temporary housing and rapid repair and reconstruction of permanent housing that meets the needs of all residents' income levels. Housing disaster survivors is a prerequisite to all other components of long-term post-disaster recovery. At the same time, the success of housing recovery efforts depends on other aspects of post-disaster redevelopment such as infrastructure restoration, job recovery, social service provision, and land use controls. In order to take advantage of opportunities to do more than just replace the damaged housing to pre-disaster conditions, such as providing safer and more affordable and sustainable housing options, public outreach and intergovernmental and stakeholder coordination are essential components of the process.

Representative agencies and organizations that will play a major role include:

State/ Regional Agencies and Organizations

- Florida Community Loan Fund
- Florida Department of Economic Opportunity, Division of Housing and Community Development
- Florida Department of Financial Services
- Florida Home Partnership
- Florida Housing Finance Corporation
- Florida Insurance Commissioner's Office
- Florida Manufactured Housing Association
- Florida Retailers Association
- Volunteer Florida

Local Government Departments

- Affordable Housing
- Building/Construction Services
- Code Enforcement
- Historic Preservation
- Homeless Services
- Housing Authority
- Planning/Growth Management/Community Development
- Zoning/Permitting

Other Organizations

- Apartment Associations
- Builders/Contractors Associations
- Non-Governmental Organizations
- Realtor Associations
- United Way, etc.

Availability of Temporary Housing/Long-term Sheltering (1)

The lack of temporary housing or long-term shelters can be a serious detriment to post disaster recovery. If people whose homes are uninhabitable have nowhere in the area to return to after a major or catastrophic disaster, repopulation and resumption of businesses will greatly slowed. The aftermath of Hurricane Katrina is a prime example of this issue. Inhabitable residential units in New Orleans were in demand and had high price tags attached. Much of the low-income population had to start over in the towns they were evacuated to or where they have friends or family. The current population of New Orleans is a fraction of what it was and employees for businesses were in short supply.

Having adequate temporary housing is also critical to minimizing the time emergency shelters need to remain. Because county public schools double as emergency shelters, in order for the schools to reopen, those who have nowhere to go until their homes are repaired or they can find new permanent housing will be forced to find other accommodations outside the impact area.

The identification of temporary housing and long-term sheltering requires planning at the local, regional and state level and is not something that should be left up to federal officials alone. As was seen with the “FEMA city” in Charlotte County after Hurricane Charley, simply finding space and running utilities for Federal Emergency Management Agency (FEMA) trailers may not always be the best solution. It can lead to crime and serious depression for those who must live in that situation (Kaufman, 2005). Another issue with relying solely on trailers and other outside assistance after the storm is that temporary solutions may become long-term necessities if reconstruction is slow and lengthy. This has been a problem in Florida, and caused worry in the Gulf Coast, as temporary mobile homes could experience another tropical storm or hurricane. Often, sites for temporary housing eventually become permanent residential areas, and the



community may want to designate areas for temporary housing that are compatible with residential uses (Florida Department of Community Affairs, 2006).

The county's Temporary Housing Plan for Disaster Events details the processes, systems and concepts associated with transitional, interim and permanent housing strategies in the aftermath of a disaster. During the early phases of the long-term recovery and redevelopment process transitional housing (depending on hotels, motels, community centers and convention centers) and interim housing (depending heavily on rental units, vacant homes and condos, travel trailers, mobile homes, public gathering sites, parks and campuses, and vacant commercial and industrial properties) will likely be prevalent.

The county's mobile home and RV parks are also given high priority because of their existing infrastructure. The plan identifies a number of vacant parcels throughout the county deemed suitable for siting trailers and/or tents for temporary housing. Identified parcels, were selected based on such criteria as access to infrastructure, community needs, and land use suitability. The Temporary Housing Plan is periodically reviewed, updated and enhanced by the Department of Housing and Community Development.

Temporary Housing Siting Criteria, Provision, and Removal (1)

A quick and efficient transition of residents out of shelters and into safe, interim housing following a disaster is imperative to prevent the emigration of population to other communities. A best practice, when safe and feasible, is for communities to allow individual placement of interim housing on private property during repair and rebuilding as well as allowing employer-supplied temporary housing on commercial properties. Temporary group housing sites will be necessary for disaster victims that live in areas where on-site interim housing is not logistically feasible (e.g., infrastructure is severely damaged or the area is within the 100-year floodplain) and to accommodate displaced renters. Although temporary in nature, group sites may be active for 2 or more years and can require a large investment in infrastructure, including roads, sewer and water treatment, and electric distribution. To ensure that interim housing is well placed, communities can choose sites before a disaster or develop siting criteria that can be used to guide the designation of these sites to the optimal locations after a disaster. Criteria can be used to ensure that housing sites are consistent with the Future Land Use Maps, are located near employment centers, and have access to public transportation. The ideal scenario are temporary group housing sites that can do double duty – provide temporary housing to disaster survivors and then transition into a permanent, affordable housing development (affordable because the developer could save money on site preparation and infrastructure previously paid for through disaster funding). Indiantown Non-Profit Housing, Inc. partnered with FEMA to attempt such a project in Martin County after the 2004 hurricanes, but unfortunately the final permanent development was unable to come to fruition immediately afterward. It is also important to ensure that disaster housing is, in fact, temporary and that removal timeframes and procedures are in place and enforced. Experience shows that assistance in transitioning to permanent housing may need to be provided to disaster survivors to ensure that interim housing can be removed in a timely manner.

Ability to Reconstruct Homes Rapidly (1)

Having an adequate supply of materials and labor is important to prevent delays during reconstruction. The high demand for supplies needed for repair work after a disaster often results in a sharp rise in prices for materials as well as shortages. This coupled with the high demand for licensed contractors and skilled construction workers to do repair work after a disaster, could result in a lag in the rebuilding progress. During short-term recovery, efforts to recruit qualified workers to the area, process their credentials, and educate residents on hiring licensed contractors is an important factor in setting the speed of redevelopment. An organized volunteer force can assist in this initial push for speedy repairs, and the PDRP Executive Committee and Housing Working Group serve a critical role in planning for volunteer resource use. Long-term rebuilding, however, provides an opportunity for retaining or developing a local construction workforce that can help to revitalize the disaster-weakened economy.

Expedited post-disaster repair permitting and inspection processes can increase the community's ability to reconstruct homes rapidly. An important pre-disaster action is to analyze permitting and inspection procedures for opportunities to make temporary changes post-disaster that will allow for faster operations without compromising quality. Augmented staffing will likely be necessary post-disaster. Memorandums of agreement with other local governments can be pursued as well as cross-training of other local government staff for short-term increases while new, temporary hires may be needed for the duration of the redevelopment period.

The State of Florida requires that contractors be licensed in state (with exceptions for post-disaster volunteers). One strategy to ensure that residents are able to find qualified contractors is to create an easy system that allows residents to post their needs and contractors to advertise their skills. Local government-regulated message boards or databases in public places like Disaster Recovery Centers could offer residents the assurance that they are dealing with properly licensed contractors and give contractors a simple way to find business. These locations are ideal to disseminate other helpful information to the public, such as resources available through the Florida Disaster Contractors Network website (www.dcnonline.org) and license verification offered through the Florida Department of Business and Professional Regulation (<http://www.myfloridalicense.com>).

Palm Beach County's Private-Public Partnership supported Florida International University's development of the Business Continuity Information Network which, among other things, provides for the posting of needs and services. In addition, one of the planned initiatives of the Partnership is working with roofer and contractor associations to develop a rapid contractor mobilization system with prequalified local, regional and state firms, including mutual aid agreements with chapters throughout the state.

Transitioning Residents Back to Permanent Housing (2)

Many residents will have the means to repair or rebuild their homes on their own, but will need clear guidance from local government on the process and methods they can use. Others in the community will require much more assistance on issues such as understanding disaster assistance programs, navigating insurance claims, finding reputable contractors, understanding their renters' rights, and making decisions on whether to rebuild. Navigating insurance matters and Federal assistance can be complicated, and even more so following a disaster. Community outreach and counseling services, such as legal assistance to survivors in interpreting insurance policies to help ensure that the maximum benefit can be obtained from their claim, are important for the success of housing recovery. The Plan can include a local strategy to organize and target various resources for public education, counseling, and case management throughout long-term redevelopment to ensure that government assistance is fairly and equitably provided to disaster survivors who need help moving out of temporary housing.

The issue of transitioning residents back to permanent housing is inextricably tied to many other post-disaster redevelopment issues, particularly socioeconomic issues. After the 2004 and 2005 hurricane seasons, there was a jump in homelessness relatively consistent with heavily damaged counties and some people were without homes for years after the events (Skoloff, 2006). Numerous homeowners and renters may find that they are underinsured after a disaster

and cannot afford the necessary repairs or replace the destroyed contents of their homes. The average FEMA individual assistance grant is between \$5,000 and \$6,000, with a maximum grant being only \$29,900 for a household. Small Business Administration (SBA) loans can provide additional funds; however, there are credit requirements that, while less stringent than private loan eligibility, may still be unattainable for some portions of the population. Voluntary Organizations Active in Disasters (VOADs), Long-Term Recovery Organizations (LTROs), and other community-driven funding sources are essential in providing case management to assist low-income and under-insured residents with locating and transitioning back into permanent housing. These organizations' roles should be pre-identified and their capabilities assessed and enhanced appropriately.

In 2004 and 2005, the Florida legislature appropriated one-time hurricane housing recovery funds. These were administered by the Florida Housing Finance Corporation through two main programs:

- Rental Recovery Loan Program, established to leverage existing Federal rental financing programs to provide additional rental stock to the areas of Florida hurt by the 2004 hurricanes
- Hurricane Housing Recovery Program, established to accommodate the different housing needs of each impacted community through the State Housing Initiatives Program for households with incomes up to 120% of the area median income, with 30% of program funds reserved for low-income households.

The Florida Housing Finance Corporation also created the HOME Again Program in 2004 to provide up to \$21 million statewide for the repair, reconstruction, or replacement of homes damaged during the storms. In 2006, the Florida legislature passed an affordable housing bill (Ch. 2006-69, s. 31, laws of Fla.) that also contained funding for two more hurricane housing-related programs: 1) Farmworker Housing Recovery Program and 2) Special Housing Assistance and Development Program.

Rebuilding Affordable Housing (3)

The affordable housing gap will be wider after a disaster. Low-cost housing tends to be concentrated in older buildings of substandard construction and older sections of town, is often disproportionately damaged, and displaced persons from this type of housing might not be able to afford rents in repaired or rebuilt buildings (Spangle et al., 1991). The sense of community and neighborhood fabric could be destroyed if widespread displacement or gentrification occurs after a disaster. Redevelopment projects not only need to include some affordable units, but they also need to include a realistic proportion to meet the needs of the community. Therefore, an effort needs to be made to replace affordable housing, especially in areas that may see a jump in property values after a disaster. There may also need to be post-disaster monitoring of whether the demand for rental housing units is being met. In addition to providing affordable alternative housing to low-income disaster survivors, actions need to be taken to prevent widespread gentrification of damaged neighborhoods through programs that assist low income homeowners in repairing or rebuilding their homes so that they can remain in them (see previous issue discussing the transition back to permanent housing).

Encouraging Homeowners to Incorporate Mitigation During Rebuilding (3)

One of the main purposes of the Post-Disaster Redevelopment Plan is to further disaster resiliency goals. Efforts to include hazard mitigation in the repair and reconstruction of disaster-damaged housing stock are integral to building a more resilient. After a disaster, there will be a rush to rebuild, as residents wish to return to normalcy. Due to this rush, a lack of information, or the perceived costs, residents may overlook opportunities to include hazard mitigation and prevent repetitive loss. The window of opportunity for encouraging homeowners to voluntarily exceed building requirements and include more mitigation only lasts a short time after a disaster. There are a multitude of proven and cost-effective hazard mitigation techniques and information, educational materials, and even training available through several nonprofit organizations and government agencies (e.g., FEMA, Institute for Business and Home Safety, Federal Alliance for Safe Homes, Firewise, etc.). The county should explore the possibility of promoting mitigated rebuilding by offsetting the add-on cost of mitigation with energy saving construction.

A public outreach strategy for reaching homeowners at the right moment with hazard mitigation information and technical assistance should be developed and articulated. The strategy should be integrated with pre-disaster education strategies in the LMS and relevant short-term recovery operations detailed in the Recovery Plan should be coordinated with the long-term strategy.

Economic Redevelopment

The ability of a local economy to rebound after a disaster dictates the success of the community's long term recovery. The return of jobs, tourism, capital investments, consumerism, and other indicators of economic health are interdependent with housing recovery, infrastructure restoration, environmental restoration, and social service provision. The involvement of the private sector in the post-disaster planning process is imperative for determining the priorities and actions that will be beneficial in restoring your local economy. Consideration must be given to the different obstacles that could potentially hinder economic recovery, such as those that small businesses will face, decisions large employers will have to make on whether to relocate, opportunities for sustainable diversification of the economic base, as well as job training and workforce recruitment to meet changed market conditions after a major disaster.

Representative agencies and organizations that will play a major role include:

State/Regional Agencies and Organizations

- Enterprise Florida, Inc.
- Florida Department of Agriculture and Consumer Services
- Florida Department of Financial Services
- Florida Hotel and Lodging Association
- Florida Office of Tourism, Trade, and Economic Development
- Florida Retail Association
- Florida Small Business Development Center Network
- Regional Planning Agencies
- Workforce Florida

Local Government Departments

- Economic Development Office
- Business and Industry Unit
- Small Business Assistance Office

Other Organizations

- Business Development Board
- Private Public Partnership
- Chambers of Commerce
- Community Redevelopment Agencies
- Economic Development Council/Commission
- Local or regional tourism organizations
- Port Authorities
- Small and minority-owned business assistance organizations
- Workforce assistance organizations
- Small Business Development Centers

Resumption and Retention of Major Employers (1)

Rapid resumption of major employers is key to economic recovery after a disaster. Many major employers in the county have established business continuity plans. Especially when these firms have ongoing business obligations outside the impacted area and/or see that recovery will be slow and protracted, these continuity plans may call for the temporary or permanent relocation of all or parts of their business operations. Loss of large employers can have a profound impact on the local economy for years in terms of employment, lost sources for goods and services, disruptions to core target industries, lost tax revenue, and damage to community image and quality of life. Replacement of lost businesses, even if possible, can take years. One only need look to the Gulf experience, post Andrew Homestead, and post 9-1-1 New York City to see the economic scars that can result.

A key element to business resumption and retention will be the preventing the escalation of damage. Early access to facilities following major disasters is critical to damage assessment, the salvaging and securing of critical assets, taking actions to prevent further damage and losses, and planning and initiating business recovery actions. Credentialing for early reentry is an important, but often contentious matter, balancing safety and security concerns with expediency. However, credentialing of major employers' Business Continuity Managers or other safety qualified personnel can be underestimated in its importance and should be a priority.

Another key in exercising business continuity options is getting realistic estimates on utility outages, road clearances, etc. Without this important information, relocation decisions may be hastened, unnecessarily.

Expedited permitting of disaster repairs for large, service critical, resource-rich businesses can

kick start the economic "rebooting" process by generating cash flow business activity, getting people back to work, reducing dependence on outside assistance, and creating demand for smaller businesses as customers, suppliers, vendors, etc.

If businesses do not feel a sense of connection to the community or fear that recovery will not be successful, they may relocate their company elsewhere after a disaster. This is especially the case for corporate headquarters and industries that are not location-dependent or whose location choice is tied to quality of life factors. The organized, holistic approach to recovery and redevelopment reflected by the PDRP can provide the private sector with confidence in the community's ability to recover and continue providing the market environment necessary for them to conduct their business.

Timely and forthright pre and post disaster communication on redevelopment goals and expectations can be a powerful influence in retaining businesses. Ultimately, incentives may be required to ensure retention of certain key businesses.

The long-term success of economic recovery relies on strong pre and post disaster support and communication between the public and private sectors. Palm Beach County's leading edge private-public partnership and the South Florida Disaster Resiliency Coalition are key mechanisms for ensuring the productive engagement of the business community in the entire emergency management process, especially long-term recovery. These partnerships, made up of local, regional, state and national business, government and NGO partners, increase the county's capacity to protect its business base and to mobilize its exceptional resources and expertise for community and economic recovery and redevelopment.

The partnerships, independently and in collaboration with the county's business and industry unit (ESF 18) function, plans and undertakes private sector led initiatives designed to build a more disaster resilient community and to facilitate post disaster recovery. Initiatives completed or in process include a web based private-public portal system (Business Continuity Information Network), legislation to ensure the availability of fuel on evacuation routes, private sector provided emergency housing for victimized first responders and their families, workshops and symposia on critical business preparedness subjects, pre and post disaster communication protocols, and much more. At this writing efforts were progressing to create a companion regional public-private partnership to share ideas, collaborate on initiatives and establish a foundation for business mutual aid. Government participation in the partnerships is coordinated by the regional Divisions of Emergency Management.

Small Business Assistance (1)

Small businesses comprise the majority of businesses in the Palm Beach County and the state. They provide the majority of jobs and are key contributors to the economy. They are more likely than large businesses to either not reopen after a major disaster or fail after reopening. Several factors may be involved in these failures, including the extent of damage to the community, the time until they can reopen, changing demands for goods and services, underinsurance, and lack of financial reserves.

Short periods without cash flow can be catastrophic to small businesses. Small businesses often find that restrictions and timing of loans and other assistance offer too little, too late to, with too many strings attached to meet their needs. The Florida Small Business Emergency Loan Program can assist businesses in the struggle to stay afloat until survivable economic conditions resume or a longer-term loan can be secured. It offers State-funded bridge loans to businesses with 100 or fewer employees, lending companies up to \$25,000 interest free for six months. However, in order to qualify for a bridge loan, a business must have suffered substantiated "physical" damage (e.g., damage to a facility, loss of equipment, inventory, etc.). Small businesses without interruption insurance and who experience only indirect disaster impacts may still struggle to survive and recover. The SBA gives disaster loans to small businesses with up to 500 employees that qualify. Qualifying businesses must have reasonably good credit; but, if the business has assets and credit that exceed a certain threshold, the business may be required to secure a commercial loan. Loans are typically based on the pre-event business and tax returns of the firm and require extensive collateralization. Post-disaster market changes, however, may mean the company isn't able to do as well

as it did pre-disaster, and the loan, even at below-market interest rates, sometimes becomes a burden to the long-term survivability of the business (Alesch et al., 2001).

There are not a lot of federal or state assistance programs available for small businesses. The Small Business Administration offers some helpful services to small businesses, but a lot of the recovery burden ultimately falls to self-help, local and state programs if available, and businesses helping businesses.

A key planned initiative of the private-public partnership in Palm Beach County is to build on the SBA's Small Business Development Center Network concept to establish plans and procedures for the opening post disaster "business recovery centers"... full service, one stop locations where a full complement of financial, counseling and other services is made available to businesses and their employees.

Workforce Retention (1)

Post disaster recovery must be accomplished in an environment of rapidly changing labor conditions. Jobs will be lost from temporary or permanent business closures and relocations. Workers and their families may flee the county before or after the disaster for safety reasons or to avoid post disaster chaos and stress. Some who evacuate may never return; others may wait for certain recovery milestones to occur (e.g., available housing, school re-openings, business re-openings, etc.) before returning.

At the same time unemployment rises, some businesses and industries will face shortages in needed skill areas, particularly skills needed to perform recovery work. Worker retention in certain service and critical skill businesses will be a major challenge.

A number of actions may be needed to deal with the mismatch of worker needs and available workers. Key among these are:

- Actions such as ensuring that schools reopen as soon as possible and childcare is available, allowing temporary on-site housing for employees, and communication of a community's post-disaster plans can assist in getting employees back to jobs as soon as the businesses reopen.
- To assist in meeting changes in labor demand and to ensure that local workers are given "first preference" in filling recovery and post disaster jobs, certain rapidly organized and executed workforce training programs may be needed. Workforce stakeholders and local education and training institutions and trade schools should be prepared to offer a full range of emergency programs.
- Consider workforce retention strategies beyond training, including temporary wage subsidies and other creative solutions. Workers will move, if necessary, where there is available employment after a disaster in order to support their families and themselves. The provision of wages – even on a temporary basis – may be key to retaining the community's skilled labor force.

After September 11, 2001 federal funds were used to provide wage compensation for employees of small and medium-sized businesses directly impacted by the attacks. Regardless of whether they were working or not, employees received wages for up to six months. Businesses noted that this retention program was key to helping them keep the doors open and transition into recovery.

Because of its strong, diversified economy, its base of well positioned growth industries, its skilled labor force, and its outstanding quality of life features, Palm beach County should have the potential to recover its business base quickly, while retaining a quality workforce.

Preferential Use of Local/Regional Business Capabilities and Workers in Recovery (1)

Time and time again we see examples of businesses idled by disasters and unemployed workers sitting on the sidelines while outsiders are brought in to perform recovery work... only to take their money outside the local economy when they leave. This does nothing to return the economy to health and creates a lingering dependency on outside assistance. The quickest way of rebooting an ailing post disaster economy is to jumpstart cash flow as soon as possible through productive activity. Often, businesses and employees remaining in the impacted area after a disaster event continue to have some level of operational capability and resources usable for recovery work. Where skills and resources are available and intact locally, it makes little sense to wait for outside businesses to perform recovery tasks or for employees to collect unemployment if they are able and willing to be part of their own community's rebuilding process.

Many area businesses provide goods and services which have direct or indirect relevance to recovery needs. Some may require outside assistance in amassing needed equipment and materials or may need a base facility from which to work. Given the proper information prior to a disaster and a line of communication to those in charge of recovery work, many businesses would be able to speed recovery efforts and at the same time reduce their disruption losses from the event. Those companies who are unable to assist in recovery may have skilled employees who could benefit from recovery work until they are able to return to their jobs. Similarly, they may have equipment, facilities or systems that could be used for recovery purposes. Use of a local labor force may also minimize the post disaster skill drains that may occur when workers with marketable skills leave to pursue work outside the impacted area. (Truesdale, public presentation, 19 April 2006)

As described earlier, in an effort to engage the area's exceptional private sector resources and capabilities, Palm Beach County has played a key role in efforts to establish two private-public partnerships (a county partnership and a regional private-public partnership) comprised of business, government and non-governmental entities dedicated to building more disaster resilient communities and increasing local disaster management capacity through private sector led initiatives. Among the initiatives planned by these partnerships are: the development of procedures that will enable the rapid mobilization of local and regional resources following disasters; establishment of relationships with FEMA's Private Sector Office and FEMA NDRF/ ESF #14 (Long-Term Community Recovery); development of interactive systems which allow recovery

needs to be matched with available local resources, and a number of businesses helping businesses programs.

Tourism Renewal (2)

Tourists are naturally apprehensive about planning vacations to a community that has recently experienced a disaster; however, Palm Beach County's economy is highly dependent on tourism and the need to reestablish this revenue stream as soon as possible will be pressing. Redevelopment priorities and strategies will need to consider aspects of the community that draw tourism, i.e. its natural attractions such as beaches, its resorts and hotels, its recreational activities such as boating and fishing, and its entertainment and cultural attractions. "There must be a commitment by both public and private entities to rebuild recreational amenities and arts, culture, and conference facilities that draw tourists and business travelers back to the region in the months and years after a hurricane." (Puszkin-Chevlin et. al., 2007)

Coastal communities need to assess whether tourism-based businesses, such as accommodation and service industry establishments, need assistance in understanding land use strategies to reduce vulnerability and finding ways to assist them in rebuilding in a less vulnerable way.

Palm Beach County must be prepared to launch aggressive and creative marketing campaigns to build public confidence in the recovery efforts and to advertise that the community is open for business. These campaigns will need to more than offset the tendency of media outlets to emphasize visual images, negative reports, and shortfalls in response more than reporting progress in the recovery process. The state PDRP guidebook points out that while local festivals and cultural activities may seem like a low priority in the aftermath of a disaster, such events can be good opportunities to attract positive media attention and tourists to the area while showcasing the successes of recovery and redevelopment efforts. They can also help in restoring a sense of normalcy to the community. A successful example was the "Florida Live" campaign launched by Visit Florida after the Deepwater Horizon oil spill.

Physical Economic Redevelopment Projects (3)

Opportunities may arise after a disaster to move forward with planned physical economic development projects or to create new projects that take advantage of post-disaster funding, available land, and/or public will. Economic development projects that are disaster-resilient and fill a need in the community after a disaster should be a priority for post-disaster funding. In addition, the community should consider prioritizing projects that incorporate energy efficiency and other "green" building design considerations. Community Redevelopment Agency districts, Enterprise Zones, and other business districts might be prime locations for focusing post-disaster redevelopment projects since these districts offer financial tools or incentives such as tax increment financing, reductions on impact fees, and State tax incentives. Economic leaders should also consider ways to expand these business districts and leverage funding that would be available through disaster programs from several Federal

agencies, including the Community Development Block Grant program and Economic Development Administration disaster assistance program.

Agricultural Losses from Hurricane Damage or Lake Okeechobee Dike Breach (3)

Representing over \$2 billion in economic impact to the county, and encompassing approximately 37% of the total land in the county, commercial agriculture is one of the county's core industries and major employer. (Palm Beach County Cooperative Extension Services/UF-IFAS, 2011)

With an estimated \$988 million in total agricultural sales for 2008-09, Palm Beach County leads the State of Florida, all counties east of the Mississippi River, and is one of the ten largest producers in the United States. Palm Beach County leads the nation in the production of sugarcane, fresh sweet corn, and sweet bell peppers. It leads the State in the production of rice, lettuce, radishes, Chinese vegetables, specialty leaf, and celery. Palm Beach County is third in the state in nursery production. It leads the state in agricultural wages and salary with over \$341 million per year.

According to recent land use analysis, 16,298 acres of the unincorporated agricultural lands are located in flood zones; and all of the acres are subject to high winds from hurricanes (Florida Department of Community Affairs, 2006). The incessant rains associated with tropical storms and hurricanes can cause severe flood damage to crops.

Flooding caused by a major failure in the Herbert Hoover Dike would have catastrophic economic consequences for farmers, their employees, and the local economy, perhaps even impacting the national food supply. While little can be done to prevent such agricultural losses, besides ongoing efforts to strengthen the dike, the government can assist by ensuring agricultural recovery is treated as a high recovery priority and by fully leveraging financial assistance programs for farmers and the workers who will be essential to rebuilding the industry. Small farm operations, nurseries, etc. cannot be overlooked.

Opportunities to Sustainably Restore Economic Vitality (3)

Retaining existing businesses is the first priority after a disaster; however, post-disaster redevelopment may also present an opportunity for businesses to reassess their long-term applicability in the local market and take advantage of any changes in demographics, and/or business incentives that may occur due to disaster impacts and the influx of outside funding into the area. A business that was struggling before the disaster and faces a continued gloomy outlook in the post disaster environment, might seize the opportunity to rethink its business plan and use the disaster as an entrepreneurial impetus to reinvent itself to better match the needs and demands of the new economic environment. "Businesses whose owners were able to adjust to changes in consumer demand were much more likely to survive than those whose owners simply pursued their pre-disaster activities in the same old way." (Alesch et al., 2001)

Inevitably, some large and small businesses that receive a significant amount of damage or indirect losses are going to fail or choose to relocate after a major disaster. This will

affect the unemployment rate of the county unless new businesses replace them. Ideally, local communities will have sufficiently diverse spectrums of businesses that if one industry sector is severely impacted by a disaster, the majority of the workforce will not be affected.

Efforts to diversify the local economy with industries that are less vulnerable to disasters should be integrated with other ongoing economic development activities. Industries targeted for attraction and incentive programs after a disaster ideally should be those that will contribute to a more disaster-resilient and sustainable economy and are appropriate for the post-disaster circumstances. Many of the leading industry clusters outlined in the county's *Strategic Economic Development Plan* are sustainable with appropriate business continuity and mitigation planning. Some of these are very dependent on a skilled workforce and will require quality of life factors that can attract talented workers.

Health and Social Services

The socially and economically vulnerable who are invariably among the most severely affected by disaster events. Researchers have found that while disasters do not create or fundamentally change the existing social and economic trends in communities, they do magnify them (Kates, 1977). Each community's level of social vulnerability and the extent to which health and social services are effectively delivered will greatly influence the success of long-term community recovery.

Each community will need to address its own set of issues based on the current demographic and socioeconomic characteristics of its residents. Post-disaster redevelopment actions and strategies should address long-term recovery health and social needs, particularly those that have been exacerbated by the disaster, and ensure the best possible services are provided. A challenge for communities will be ensuring a smooth transition of health and social services from short-term recovery operations to long-term redevelopment assistance.

Each community's planning and preparations should consider the following questions:

- Are your health care facilities likely to sustain major physical damage during a disaster?
- Does a significant proportion of your population currently depend on social services?
- Does your community contain a large percentage of socially vulnerable populations, including the disabled, senior citizens, racial and ethnic minorities, language isolated, single parents, impoverished, etc.?
- Do socially vulnerable populations reside in areas likely to be devastated by a disaster?
- Does your community have the capacity and procedures in place to coordinate a large influx of volunteers throughout long-term redevelopment?

Representative agencies and organizations that will play major roles include:

State/Regional Agencies and Organizations

- Florida Department of Children and Families
- Florida Department of Education
- Florida Department of Elder Affairs
- Florida Department of health

Local Government Departments

- Agency for Persons Living with Disabilities
- Aging Services
- Children and Family Services
- Health Department
- Homeless Services
- Public Transit
- School District
- Social Services Agency

Other Organizations

- Palm Beach County Disaster Recovery Coalition
- Local private advocacy/philanthropy groups
- Local volunteer organizations, including Community Emergency Response Teams (CERTs) and Community Organizations Active in Disaster (COADs)
- Major local health and medical facilities

Health Facility Restoration (1)

Medical services will be great demand following major disasters, but providers may experience a number of factors which can inhibit their ability to keep pace with community needs and demands. Staff shortages, facility damages, and inadequate financial resources all may be significant limiting factors. Other factors that could potentially influence the ability to restore health services include how quickly essential utilities and infrastructure are repaired, changes in the patient demographics, the location of the facility in relation to population densities, and the availability of qualified contractors.

The reconstruction period can offer opportunities to fix and upgrade existing health and medical systems that will benefit residents long-term. During response and short-term recovery, there will likely be temporary medical service increases, including temporary public and faith-based clinics. Integration of temporary resources, labor, or funding into the existing local healthcare structure can improve local capacity and prevent disruptions during long-term redevelopment when the temporary increases are terminated.

Social Services to Socioeconomic Vulnerable Populations (1)

Socially and economically vulnerable populations (including the financially disadvantaged, homeless, children, senior citizens, racial and ethnic minorities, single-parent households, etc.) are likely to become more dependent on assistance after a disaster event and their needs will change throughout the different phases of redevelopment. Potential challenges to successful service provision include the lack of available programs and insufficient access. Systems that are functioning to maximum capacity before a disaster will become overwhelmed as more residents need assistance. The county needs to be prepared to increase capacity and adapt services, as necessary to meet changes in need and access needs to be maintained as programs change during long-term redevelopment. Populations also may shift locations during the redevelopment period. Access to adequate transportation options will be critical.

As a Post-Disaster Redevelopment Plan evolves into a more complex plan, the issue “Social Service Provision to Socioeconomic Vulnerable Populations” may need to be broken down into more focused issues, each with a topic-specific strategy. The issues will vary by community, depending on the specific population and its needs. Some of these issues that a community may want to address include the following:

- Low-income assistance – Low income residents are often the hardest hit by disasters and require more government assistance than usual. This may require increased numbers of social service personnel and additional funding for assistance programs.
- Households and businesses at higher socioeconomic levels are more likely to recover to pre-disaster levels, and those who are better integrated into economic and social networks will recover faster. Conversely, those with fewer resources often get less attention from aid organizations and get it later. Lower income groups tend to have a weaker voice in recovery decisions, unless explicitly integrated into the decision processes (Olshansky, 2006).
- Homeless programs – There is often an increase of the homeless population after a major disaster due to the destruction of a significant amount of affordable and older housing stock. The already existing homeless population should not be overlooked during post-disaster recovery.
- Children and family services – Disasters may cause an increase in the number of families seeking assistance, at a time when personnel and resources may be in short supply. A number of new disaster-related problems also may arise as a result of anxiety and stress. For example cases of domestic abuse often increase during the stressful recovery period after a disaster. Children may have adjustment problems such as performing poorly in school, as a result of changed living circumstances.
- Targeted assistance for senior citizens – Over 22% of the population of the County is over the age of 65 and potentially less able to successfully recover from a disaster due to financial or health reasons. Many senior citizens live on fixed incomes and may not have resources for home rebuilding or preparatory measures. Also, there is an increased likelihood that seniors may be more susceptible to fraud and exploitation than other populations during times of

crisis. They may need additional assistance due to a variety of chronic health problems, including cognitive impairments and diminished mobility.

- Assistance programs targeted towards racial and ethnic minorities – While racial and ethnic minority concentration alone is not an indicator of social vulnerability, racial and ethnic minority populations are likely to be more vulnerable to disasters due to factors such as economic situation, housing patterns, building construction, community isolation, and cultural insensitivities (Fothergill et al., 1999). Language can be a barrier impeding some ethnic minority concentrations from adequately accessing and navigating the available relief system. Public outreach initiatives will need to be translated into other languages for those whose native language is not English.
- Services for women – Research has shown that the experience of women and men differ in the post disaster environment; however, most disaster work assumes a gender-neutral social system. (Morrow, 1996) Female-headed households may need targeted assistance post-disaster. Of the thousands who lost their jobs after Hurricane Andrew, women were not likely to find substitute work related to clean-up and reconstruction activities. Most women held lower-wage jobs with working conditions that allowed little job security, making them particularly vulnerable after a disaster. While few were able to find work related to recovery, in general, it was much harder for women to find replacement employment (Morrow, 1996).

Re-establish Public Safety Service Levels (1)

Public safety service must be quickly reestablished after a disaster. This may necessitate a temporary increase in local safety personnel despite revenue losses that may strain resource availability and public safety funding during long-term recovery. Public safety facilities are sometimes located in areas that are vulnerable to severe damage during a disaster event. Communities can use the recovery period to reconsider the location of public safety facilities and capitalize on opportunities to permanently move them if they are temporarily unable to operate.

Coordination and Assistance for Non-Governmental Organizations and Volunteers (1)

Immediately following a major disaster, there will be an influx of volunteers to aid in short-term recovery efforts. With organization and coordination this can be a substantial asset to the recovery process. Volunteer Florida is a resource that can be tapped to help with this coordination.

Typically, as media attention wanes after the initial response and recovery, so does the interest of potential volunteers. However, if a volunteer effort is particularly well-promoted and organized, it can be helpful well into the long term redevelopment phase. Palm Beach County has extensive long-term recovery organizations such as the Disaster Recovery Coalition, Community Emergency Response Teams (CERTs), unmet needs committees, etc. that can be utilized to help organize a sustainable volunteer effort. The capacity of these groups should be bolstered periodically to ensure they can provide optimal services when a disaster occurs.

Long-term recovery organizations are critical to the recovery of the community. Not only do they provide a mechanism to assist individual survivors directly, but particularly progressive organization may be able to take on advanced redevelopment functions, including: coordinating Community Development Block Grants on behalf of local governments, taking responsibility for FEMA travel trailers, assisting in the rebuild of permanent housing stock and implementing mitigation measures for the economically disadvantaged. Long-term recovery organizations that are able to effectively express their future actions and needs to the volunteer community, with help from the volunteers and donations support functions, can be helpful in securing additional donations and volunteer assistance to address long-term needs.

Provide for Special Needs Populations Throughout Long-Term Redevelopment (1)

Special needs populations, including those living in nursing homes and assisted-living facilities as well as homebound populations will require distinct assistance after a major disaster. Disabled populations are going to need special accommodations and temporary housing during evacuation and recovery. There may be many, beyond the county registration list, that will need long-term assistance. Attention will need to be given to nursing home and assisted-living facility residents during long-term redevelopment as evacuated residents return to their home facilities. There is likely to be a shortage of qualified staffing and suitable facilities. The return of residents will need to be closely coordinated with emergency management personnel. Some financial assistance or mutual aid agreements may be needed.

According to Global Action on Aging, after Hurricane Katrina medical clinicians in Louisiana reported that the health status of patients returning to their care had declined significantly. Facilities will need to take into consideration the length of time it takes to improve the health status of many returning nursing home evacuees (especially those who may be experiencing functional and mental decline) in determining the number of staff, facilities and required expertise they need to have on hand throughout the redevelopment phase.

Public Transportation Restoration and Improvement (1)

After a disaster, changes in the locations of housing and employment centers (temporary or permanent) may alter a public transit needs, with the likely probability that greater numbers of people will depend on public transit. Post disaster redevelopment projects may present unique opportunities to expand existing transit capabilities consistent with the multimodal needs of the long-range transportation plans. Any changes to public transit should be closely coordinated with stakeholders having expertise in Land Use and Infrastructure.

Reopening of Schools (2)

Beyond its importance to educational continuity, quickly reopening schools and institutions of higher education will be important to establishing a sense of normalcy and providing some semblance of consistency in lives of students. The transition of residents from public shelter schools to interim housing should be handled as soon as

possible. Except where severely damaged, schools used as emergency public shelters should be cleared and available for repairs and reopening during the short term recovery. Inhabitable schools will likely need to accommodate a higher capacity of students post-disaster, in order to accommodate those who facilities were damaged during the event.

Although disaster vulnerability is a consideration in siting schools in Palm Beach County, the redevelopment process will provide an opportunity to reevaluate the locations of damaged schools and to consider alternative sites. Schools should be urged to maintain continuity of operation plans that include long-term recovery issues.

School reopenings are a state priority. Despite the complete destruction of seven schools in Charlotte County in 2004 by Hurricane Charley, the State worked closely with the Department of Education, FEMA and local officials to secure portable classrooms, school buses, books and other instructional materials, furnishings and computers for affected schools. The Governor signed an executive order allowing waivers of certain requirements in order to expedite the reopening process. The county should consider the feasibility of similar arrangements in the event of a major disaster.

Behavioral Health Assistance (2)

In any major disaster, loss and trauma will directly affect many people. Additionally, some individuals who will be emotionally impacted simply by being part of the affected community. Witnessing massive destruction and terrible sights evokes deep feelings and reactions. Residents of disaster stricken communities experience disturbing feelings of grief, sadness anxiety and anger, even if they themselves may be spared much of the losses. Responses to such trauma are most often natural, transitory reactions, not symptomatic of pathology and thus may require practical rather than traditional clinical assistance. Trauma usually takes two basic forms and which will occur jointly and continuously during the post disaster recovery process:

- Individual trauma manifests itself in the stress and grief reactions which individual survivors experience.
- Collective trauma is a “blow to the basic tissues of social life that damages the bonds attaching people together and impairs the prevailing sense of community.” Collective trauma can sever the social ties of survivors with each other and with the locale.

Grief reactions are a normal part of the recovery from disaster. Not only may individuals lose loved ones, homes and treasured possessions, but hopes, dreams, and assumptions about life and its meaning may be shattered. The grief response to such losses are common and are not pathological (warranting therapy or counseling), unless the grief is an intensification, a prolongation or an inhibition of normal grief.

According to the *Nebraska Behavioral Health All-Hazards Disaster Response and Recovery Plan*, the traditional, office-based approach to mental health assistance is of little use in disaster. Very few people will come to an office or approach a desk labeled

“mental health.” Most often, the aim will be to provide human services for problems that are accompanied by emotional strain. It is essential, the plan points out, not to use words that imply emotional problems, such as counseling, therapy, psychiatric, psychological, neurotic, or psychotic.

Behavioral health staff need to use an active outreach approach. They must go out to community sites where survivors are involved in the activities of their daily lives. Such places include impacted neighborhoods, schools, disaster shelters, Disaster Application Centers, meal sites, hospitals, churches, community centers, and the like.

Many people equate “mental health services” with being “crazy.” To offer behavioral health assistance to a disaster survivor may seem to add insult to injury – “First I have lost everything and now you think I’m mentally unstable.” In addition, most disaster survivors will be overwhelmed with the time-consuming activities of putting the concrete aspects of their lives back together. Counseling or support groups may seem esoteric in the face of such pragmatic pressures. Very effective behavioral health assistance can be provided while the worker is helping survivors with concrete tasks. Most disaster survivors are people who are temporarily disrupted by a severe stress, but can function capably under normal circumstances. Much of the behavioral health work at first will be to give concrete types of help. Behavioral health personnel may assist survivors with problem solving and decision-making. They can help them to identify specific concerns, set priorities, explore alternatives, seek out resources and choose a plan of action. Behavioral health staff will need to inform themselves about resources available to survivors, including local organizations and agencies in addition to specialized disaster resources. Behavioral health workers may need to help directly with some problems outside the realm of behavioral counselors, such as providing information for filling out forms, helping cleanup, locating health care or child care, and finding transportation. They may also make referrals to specific resources such as assistance with loans, housing, employment, permits.

In less frequent cases, some individuals will experience more serious psychological responses such as severe depression, disorientation, immobilization, or an exacerbation of prior mental illness diagnosis. These situations will likely require referral for more intensive psychological counseling. The role of the disaster behavioral health worker is not to provide treatment for severely disturbed individuals directly, but to recognize their needs and help link them with an appropriate treatment resource. Disaster behavioral health services need to be uniquely tailored to the communities being served.

The demographics and characteristics of the communities affected by disaster must be considered when designing a behavioral health program. Urban, suburban and rural areas have different needs, resources, traditions and values about giving and receiving help. It is essential that programs consider the ethnic and cultural groups in the community and provide services that are culturally relevant and in language of the people. Disaster recovery services are best accepted and utilized if they are integrated into existing, trusted community agencies and resources. In addition, programs are most effective if workers are from the community and its various ethnic and cultural groups are integrally involved in service delivery.

Behavioral health staff will need to set aside traditional methods, avoid use of “mental health” labels, and use an active outreach approach to intervene successfully in disaster.

The most important support group for individuals is the family. Workers should attempt to keep the family together (in shelters and temporary housing, for example). Family members should be involved as much as possible in each others’ recovery.

Disaster relocation and the intense activity involved in disaster recovery can disrupt people’s interactions with their support systems. Encouraging people to make time for family and friends is important. Emphasizing the importance of “rebuilding relationships” in addition to rebuilding structures can be a helpful analogy.

For people with limited support systems, disaster support groups can be very helpful. Support groups help to counter isolation. In addition, behavioral health workers may need to involve themselves in community organization activities.

A key element of the long-term recovery process will be ensuring that public and private sector behavioral health assistance providers have the resources they need to deal with the likely influx of patients suffering post disaster anxiety and depression and stress.

Medical Personnel Retention and Recruitment (2)

Staffing healthcare facilities is a critical component of the recovery and redevelopment process. The ability to provide healthcare is necessary for residents to return and for temporary workers to do their jobs; it is also a cornerstone of efforts to make the community livable again. Given the high likelihood that there will be chronic shortages of physicians and other healthcare providers and a pressing need to fill any gaps quickly, incentive programs of one type or another will almost certainly be required in order to retain and attract qualified people. Such incentive are always very expensive and do not necessarily attract a stable workforce will to make a long-term commitment to the community.

Physicians face the temptation of relocating after a major disaster, especially when their patients vanish overnight. Many Florida hospitals that have survived big storms say it's imperative to promptly provide financial support to physicians. Some say they footed the bill for temporary physician offices for as long as two years following hurricanes (Colias, 2005).

After Hurricanes Frances and Jeanne in 2004, Health First’s Cape Canaveral Hospital in Cocoa Beach put tarps over more than 200 employees' houses, provided shelter for displaced staff, offered dry locations to store furniture to prevent water damage, distributed cash advances, and provided free 24-hour childcare (Cassidy,2004).

In many communities, attracting sufficient qualified medical personnel is an issue even during pre-disaster periods, and this trend can be exacerbated in the post-disaster environment, especially during long-term redevelopment after the initial influx of emergency medical professionals has dissipated. Communities may also have a difficult time keeping health care facilities open, especially neighborhood doctor offices and

clinics, if medical professionals have not returned to the area. Recruitment programs that can be used post-disaster may need to target a range of positions, including but not limited to providers, nursing, mental health, laboratory, radiology, pharmacy, administrative, financial, and facility as well as any other specialized or general occupations.

Long-term, the availability of local medical professionals is tied to the continuation of medical education and training in the post-disaster environment. National health and medical organizations such as the Medical Reserve Corps can provide assistance, volunteers, and resources to help prevent lapses in education programs after a disaster.

Some incentives commonly used in an attempt to retain healthcare workers have included: loan forgiveness/repayment programs, scholarships in healthcare professions; housing reconstruction subsidies; various forms of financial assistance such as dependent care benefits and financial support for children's' education; pay raises, and career development incentives.

In addition to incentives other strategies for recruiting temporary and permanent healthcare professionals include outreach advertising, the use of recruiters and the recruitment of foreign graduates who may be eager to work in the United States.

A number of factors can conspire against retaining and attracting healthcare professionals. First, they themselves and their families may be victims. Practices may quickly lose their regular patient base. Personal and professional losses can be significant. Office staff may be unwilling or unable to return to the area and to work. With the loss of jobs after the hurricanes, the numbers of patients covered by Medicaid or having no coverage at all will increase dramatically. Opportunities elsewhere may ultimately provide an irresistible escape from the stress and rigors of the post disaster environment.

Reducing the Incidence of Fraudulent and Unethical Practices (3)

Unfortunately, some people see a disaster as an opportunity to make money at the expense of victims. Fraud is rampant after a disaster, from internet scams misrepresenting the collection of donations to volunteers stealing donated items as seen recently in the Katrina Red Cross scandal (CBS News, 2006). Price gouging is also a common occurrence, although the State of Florida passed a law after Hurricane Andrew prohibiting price gouging after a declared disaster and set up a hotline for reporting any occurrences (Florida Attorney General's Office, n.d.). There also are problems with unlicensed contractors taking people's money without finishing the job or doing shoddy work. The State issues badges to insurance adjusters to prevent hurricane victims from being taken advantage of by imposters (Insurance Information Institute, 2006). The insurance companies, FEMA, and the Red Cross are often the victims of fraudulent claims. These activities have the potential to negatively impact true disaster victims because some forms of assistance may be used up before they can be helped or the procedures for claiming assistance must become more rigorous. This could keep some people from being able to obtain assistance as quickly, or at all. This also creates more

desperate disaster victims who may fall prey to predatory lenders as they try to make ends meet financially.

Another unethical practice involves the real estate market. Speculators often pounce on an impacted coastline and offer quick money to devastated homeowners who either do not understand the true value of their property after a disaster or are so upset from the situation that they hastily wish to move far away to somewhere that seems safer (Musgrave, 2004). This is especially an issue for low-income and/or minority coastal communities. There is a constant pressure of gentrification in these areas even before a disaster but many of the residents are unwilling to sell because their family has always lived there or because of the sense of community they find there. After a disaster, left with very few possessions and perhaps unemployed, some see no choice but to sell. This was prevalent in the Gulf Coast in places such as Biloxi, where working class bungalow neighborhoods along the coast quickly disappeared (Apuzzo, 2005). The area is losing historic and unique neighborhoods, while a majority of the residents are not receiving fair compensation for their properties. Education prior to a disaster and available assistance after a disaster is needed in all these instances. Post disaster outreach centers and hotlines can be important in advising people on their options and perhaps preventing decisions that will be regretted later.

Health-Related Pollution and Environmental Justice (3)

A major contributor to post-disaster health issues that may not be obvious or thought to be a health hazard immediately is mold. Mold can quickly grow to unhealthy levels in a home, business, or public building that has had flood damage. Other environmental health concerns include contact with hazardous water or soil; disposing of household hazardous waste; problems with private water wells; and poor air quality due to demolition, construction dust, debris reduction, or other causes. It is often low-income housing and neighborhoods that are impacted the worst by health-related problems, and these areas are often the slowest to receive immediate attention. According to the U.S. Environmental Protection Agency, “environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies... It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work” (U.S. Environmental Protection Agency, 2010). Environmental justice can become a significant issue post-disaster in regards to the clean-up of health-related pollution. In order to stop unhealthy conditions before they can begin, special consideration must be given to planning for timely cleanup and remediation, especially among the economically disadvantaged.

Quality of Life Factors (3)

Quality of life factors encompass a breadth of topics that vary widely in every community. Some examples include the restoration of recreation and cultural activities, community wellness programs, neighborhood and, after school activities, child care programs, and other features and amenities that provide community residents with a



sense of well-being and make the community a desirable place to live. Restoring quality of life after a disaster is an imperative step to attract displaced residents, eventually revive population growth, and rebuild social networks. After a disaster, communities have the opportunity to incorporate healthy community principles into redevelopment plans as opposed to rebuilding previously unhealthy infrastructure that limits opportunities for daily exercise, creates inefficiencies, and challenges maximizing the health of its residents. The U.S. Department of Health and Human Services defines a healthy community as one that embraces the belief that health is more than merely an absence of disease; a healthy community includes those elements that enable people to maintain a high quality of life and productivity. For example, a healthy community offers access to healthcare services that focus on both treatment and prevention for all members of the community; a healthy community is safe; a healthy community has infrastructure, including roads, schools, playgrounds, and other services to meet the needs of the people in that community; and a healthy community has a healthy and safe environment (U.S. Department of Health and Human Services, 2001).

Preserving the County's Rich Culture and Heritage (3)

Palm Beach County possesses a wide range of cultural and historical resources central to its quality of life and which serve as a magnet, attracting new residents and businesses, visitors, tourists, and special events. Among these resources are: museums of art (including the famous Norton Art Gallery), history, science, trains, the ocean, museums for children; historic downtowns, neighborhoods and structures (many listed on the National Register); world renown equestrian, polo and other sports venues; and a full range of quality eco-tourism attractions... to name a few. Many of these resources are priceless and/or irreplaceable. They deserve and require special attention, support and care during the post disaster recovery process.

Restoring Institutions of Higher Learning (3)

Palm Beach County contains campuses of eight institutions of higher learning, with Palm Beach Community College, Florida Atlantic University, and Palm Beach Atlantic University being the largest. The colleges and universities in the Gulf Coast area have been struggling since Hurricane Katrina. Most students were forced to transfer to other colleges, at least for a semester, or take a semester off. Returning to prior enrollment rates is a problem for these colleges and has stunted them financially as well. The amount of research lost from the event is also a tragedy and a loss of revenue for these schools.

Environmental Preservation and Restoration

Coastal and inland ecosystems throughout Florida provide numerous ecological services and contribute to the quality of life enjoyed by residents and tourists. Natural areas such as waterways, woodlands, beaches, dunes, and wetlands protect communities from flooding, buffer coasts from storm surge, filter environmental pollutants, and provide prime habitat for a variety of species. These natural areas also support a host of industrial, commercial, and recreational activities that are essential to the economic livelihood of the county. Major events such as a coastal storms, catastrophic wildfire, or

storm surge can damage these ecosystems. The risk of pollution, debris accumulation, and other disaster impacts is a threat to wildlife, public safety, and activities dependent on natural areas. Restoring the natural environment in the aftermath of a disaster is a key component of ensuring a community's long-term recovery. The progressive development of sea level rise promises to gradually erode our coast lines, increase the impacts of tides and storm surge on coastal habitats and plant life, cause salt water contamination of fresh water bodies and wells and otherwise intrude on valued ecological assets.

Representative agencies and organizations that will play major roles include:

State/Regional Agencies and Organizations

- Florida Department of Community Affairs
- Florida Department of Environmental Protection
- Florida Division of Emergency Management
- Florida Division of Forestry
- Florida Fish and wildlife Conservation Commission
- South Florida Water Management District

Regional Branches of Federal Agencies

- National Marine Fisheries Service
- U.S Army Corps of Engineers, Jacksonville District
- U.S. Coast Guard, Florida Sectors
- U.S. Environmental Protection Agency, Region 4
- U.S. Fish and Wildlife, Region 4

Local Government Departments

- Emergency Management
- Environmental Resources Management (ERM)
- Health and Public Safety
- Parks and Recreation Departments
- Planning/ Growth Management/ Community Development
- Public Works Departments

Other Organizations

- Local Mitigation Strategy
- Port Authorities

All applicants seeking federal reimbursement are required to comply with the National Environmental Policy Act (NEPA), as well as all other federal, state and local environmental laws and regulations. The Florida Division of Emergency Management has environmental specialists available to provide technical assistance in meeting these requirements.



Beach and Dune Restoration (1)

Beach and dune systems provide natural protection from coastal flooding, particularly on barrier islands, among other economic and ecological services such as providing nesting grounds for endangered sea turtles. Storm surge and wave action can cause extensive erosion to beach systems. Although erosion is a natural process to these dynamic systems, heavy shoreline development and the construction of navigation inlets have impaired their natural ability to recover. Acceleration of sea level rise over the coming years will exacerbate erosion, increase the vulnerability of coastal development and damage the environmental benefits of the beaches and dunes. Without a recovery strategy, tourism, recreation, and the protection that the beach and dunes provide coastal development will also be severely impacted.

Post-disaster redevelopment policies should emphasize non-structural methods of mitigating beach erosion, and public outreach should be conducted to discourage post-disaster demands for emergency armoring that can result in long-term negative impacts. The Coastal Construction Control Line (CCCL) Program is an important element in enforcing beach and dune protection after a disaster.

To receive funding for beach renourishment projects under FEMA's Public Assistance Program, a beach must be improved and routinely maintained – meaning that the beach is designed and constructed by placement of imported sand of a proper grain size and a maintenance program is established to preserve the original design. Unimproved or natural beaches are not eligible for funding for renourishment, but may be eligible for emergency placement of sand if necessary to protect improved property. Creative partnerships can also be forged between local, state, and other federal entities to secure funding for beach renourishment projects. For more information see FEMA Disaster Assistance Policy 9580.8, Eligible Sand Placement on Public Beaches (www.fema.gov/pdf/government/grant/pa/9580_8.pdf)

A potential issue for beach restoration projects is limitation of federal funding. The Coastal Barrier Resources Act (CBRA) was established to encourage conservation of barrier islands by restricting federal expenditures within designated units. Planners should consider these restrictions when thinking about implementing beach restoration projects in CBRA zones.

Environmental Contamination (1)

High winds, storm surge, and flooding can cause spills, leaks, or discharges of toxic chemicals into the environment. Seaports that handle hazardous material cargos, such as petroleum-based products, chemicals, or other environmental pollutants, are particularly vulnerable given their coastal location. Other sources of environmental pollution include wastewater treatment facilities and runoff from inland agricultural areas that process heavy fertilizer loads and gasoline from vehicles or boats. Contamination can lead to the degradation of water, wetlands, soil, and habitats. It also poses a significant public health threat. Certain disaster circumstances may dictate the need to conduct sampling to test contamination levels prior to permitting occupancy by residents. Site contamination often requires a lengthy and costly clean-up process and

may impede long-term redevelopment efforts. Existing brownfield and hazardous material programs may be able to be adapted to this potential post-disaster scenario.

Environmental and Historic Review of Temporary Sites (1)

After a major disaster, sites are often needed for temporary housing, businesses, and debris management as well as other recovery staging activities. These temporary uses will leave varying degrees of long-term impacts on the sites depending on the precautions taken. As a result of recent disasters, procedures and guidance have been increasing on methods to prevent environmental and historic degradation from recovery operations. For instance, the Florida Department of Environmental Protection and the State Historic Preservation Office must approve sites and any ground-disturbing activity. The Florida Division of Emergency Management's *Florida Greenbook: Environmental and Historic Preservation Compliance* can provide stakeholders with the foundation to determine if any actions related to this issue need to be incorporated into the Plan.

Natural Land and Habitat Restoration (2)

Natural, undeveloped lands are vital to Palm Beach County communities. Tidal wetlands, marshes, swamps, and mangroves protect against the inundation of flood waters and act as natural filtration system for pollutants and excess nutrients. These natural ecosystems as well as coral reefs, hardwood hammocks, pinelands, and scrubs serve as vital habitats for plants and animals, including endangered and threatened species. These lands also provide passive recreation and environmental education opportunities for the community. A natural disaster can devastate these areas, jeopardizing fragile ecosystems and the species that depend on them. Habitat areas at highest risk to disaster impacts include coastal high hazard areas, areas located near potential sources of debris or contamination, areas prone to flooding, and areas with a high risk for severe wildfires. Progressive sea level rise further threatens coastal habitats through inundation, increased salinity levels, and increased exposure to storm surge. Programs to protect, re-establish, and restore critical habitats will be essential to their long-term recovery.

There are programs through the Florida Department of Environmental Protection's Northwest District Ecosystem Restoration Section for restoration of coastal habitats. Funding comes from various grants obtained from agencies such as the U.S. Fish and Wildlife Service, NOAA, and the Northwest Florida Water Management District. (www.dep.state.fl.us/northwest/Ecosys/section/restoration.htm)

Green Rebuilding (3)

According to the U.S. Environmental Protection Agency, "green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and

comfort. “(EPA, 2009) Green building encompasses measures to make homes and businesses more energy and water efficient, utilize renewable energy and sustainable building materials and construction, and improve indoor air quality. The need for large-scale reconstruction in a community post-disaster provides an opportunity to make strides in achieving goals of sustainability and incorporating green and healthy design components into a large number of both private and public rebuilding projects. Communities can consider offering incentives after a disaster such as fast-tracking major redevelopment projects that meet green standards. Clean technology, which includes environmentally-friendly and alternative energy industries, is one of the leading industry clusters for recruitment in Florida and Palm Beach County. Green construction projects may provide a way to create employment and grow this field in Palm Beach County.

Parks and Urban Forest Restoration (3)

A major wind, fire, or storm surge event can severely damage parks and urban forests. A significant loss of mature trees has economic implications, presents public health and safety concerns, and has environmental impacts – urban trees and forests help reduce energy consumption, filter pollutants from the air and water, recharge aquifers, and provide habitats for many species. The restoration of parks and urban forests will affect the quality of life of residents and can be a symbol of recovery and return to normalcy. Some communities will need to restore local parks and urban forests to attract tourists as soon as the community is ready to bring them back. During the short-term post-disaster recovery period, activities related to tree restoration include a damage assessment, immediate treatment, clean up, and debris removal. Professional foresters, debris removal contractors, and recovery crews will need to coordinate their activities. For example, identifying salvageable trees by professional teams should be performed prior to clean up to avoid unnecessary removal of trees. Vegetation distress from uprooting or saltwater exposure will also require quick treatment to avoid further losses. Long-term redevelopment efforts require professional care and citizen education to address tree replacement selection, proper re-planting methods, pruning, and maintenance. Re-planting trees quickly without a broader strategy can increase vulnerability to the next storm and produce an even-aged stand of trees that lacks visual variety. Communities may have local groups such as 4-H or gardening clubs that have the expertise and interest to become involved in restoration activities.

Water Pollution from Sewer System Failures (3)

Sewer system failures in the aftermath of a major disaster are commonly attributed to pump station electrical outages. In areas of little relief and flat topography, pump stations are needed to move waste to the treatment plants. Another concern during a hurricane event is wastewater outflow. When a treatment plant exceeds capacity with inordinate amounts of stormwater inflow, intake lines overflow into surface waterbodies. In each case, inability to treat wastewater will result in the pollution of natural resources and warnings to avoid waterbodies for economic and recreational purposes. The contaminants typically include bacteria, nitrates, metals, trace quantities of toxic materials, and salts. These contaminants can destroy productive aquatic habitats. Humans also must avoid contaminated waters, as bacteria can spread disease



from the ingestion of microorganisms such as *E. coli*, *Giardia*, *Cryptosporidium*, and Hepatitis A (Oregon State University Extension Service, 1997). In Palm Beach County, where tourism is a major part of the economy, contaminated waters can result in beach closures and fishing prohibitions. Such orders can last days or weeks depending on the severity and quantity of the contamination. Of particular concern are low-income individuals who often fish for their meals in county waterways. Addressing weaknesses in the systems prior to a disaster and using generators or other means to prevent water pollution is, of course, ideal. When pollution does occur after a disaster, rapidly identifying the source and stopping it are the main courses of action in addition to notifying the public and monitoring the situation.

Preventing/Slowing Salt Water Intrusion into Fresh Water Sources (3)

When fresh water is withdrawn at a rate faster than it can be replenished, a draw down of the water table occurs, resulting in a decrease in the overall hydrostatic pressure. When this happens near the ocean, salt water from the ocean intrudes into the fresh water aquifer contaminating it with salt water. When saltwater intrusion encroaches inland until it reaches pumped wells, saltwater unfit for human consumption or irrigation can render wells useless. This is happening in many communities along the Atlantic and Gulf coasts, including a few in Palm Beach County.

Saltwater intrusion is presently a problem in several wellfields in Palm Beach County and is expected to become a problem at other wellfields in the future. Saltwater intrusion in the County can occur from the ocean and Intracoastal Waterway (Lake Worth) to the east, from residual saltwater to the west and from the Loxahatchee River to the northeast. This intrusion can be caused by wells located too close to the saltwater front or as a result of regional declines in the groundwater level. Regional declines in water levels may be caused by the cumulative impacts of many wellfields or by decreased aquifer recharge. However, proper water supply planning will help to minimize the impacts associated with increased groundwater withdrawals as population and development increase.

Salt contamination of coastal well fields could force coastal cities to abandon primary drinking wells or install new treatment systems. At this writing, at least nine well fields, from south Miami-Dade to Palm Beach, were considered “at risk”. If ground water levels fall low enough to allow an underground wedge of sea water to push deeper inland.

Salt intrusion looms as a major threat to the regional water supply, already so low that drought effects could linger for years, even with a good rainy season. If wells get too salty to supply water that meets state health standards, it could force cities to look for others sources and further strain a scare resource.

Well fields in Riviera Beach, Manalapan, Boynton Beach, Delray Beach, Highland Beach, and Boca Raton all reside east of or near the saltwater intrusion line running through coastal Palm Beach County. A wedge runs from the ocean into the porous

coastal rock, gravel, and sand, where it lurks beneath a layer of fresh water that supplies the wells.

Thus far Jupiter, Manalapan and Highland Beach and Lake Worth have built or plan to build reverse-osmosis plants to strip the chloride from the salty deep aquifer. Other coastal communities are likely to soon follow.

As it continues to develop, sea level rise promises to become an even greater contributor to the salt intrusion problem. Preventive measures and adaptation strategies for mitigating the effects of sea level rise are contained throughout this PDRP.

Increased Fuels for Wildfires on Conservation Lands (3)

Palm Beach County has been more vulnerable to wildfires in recent years because of hurricane debris that has not been cleared out of natural areas and vacant properties. The 2004 and 2005 hurricane season resulted in widespread destruction to vegetation throughout the county. On many conservation and vacant lands, these downed trees have since dried out and become dangerous wildfire fuels. Man-made debris, which accumulates in the forest lands, can contain toxic materials and increase fire intensity. The tangled debris in area forests also create “ladder fuels” which enable a forest fire to climb from the ground level to the tree crowns where it becomes much more intense and difficult to suppress as embers can be blown farther. Where trees have been toppled, removing the crowns, ground-level wind speeds increase, resulting in rapid rates of fire spread. (Florida Division of Forestry, 2005)

The hurricane debris also hinders suppression by Division of Forestry and local firefighters. One of the main wildfire suppression strategies is to create fire lines using tractors to contain the fire. The size of the downed trees and the way they have become piled on the ground make it difficult to plow a fire line and navigating through the debris slows down the process. These obstacles can also be a safety hazard for fire fighters retreating from a blaze. While wildfires are always a concern in Palm Beach County forests, the large increases in dry fuels have greatly increased the vulnerability of area homes. (Yunas, public presentation, 22 March 2006) To deal with the increased risk of wildfire that can occur after a hurricane, prior planning, education, and a coordinated strategy to reduce the added wildfire fuels are recommended strategies.

PDRP PRIORITY ISSUES & STRATEGIES BY TOPIC AREA

Housing Recovery

- Temporary housing provision and removal
 - Current policy & procedures
 - Disaster temporary housing plan
 - Unified Land Development Code
 - Manufactured housing vendors
 - Plan for temporary housing removal

- Program to assist residents' transition back to permanent housing
- Rapid repair permitting
 - Current policy and procedures
 - Review existing processes for streamlining
 - Opportunities to incentivize redevelopment and disaster resilience
 - Create consistency & clarity in disaster permitting processes
 - Pre and post disaster education on permitting procedures
- Temporary housing siting criteria
 - Current policy & procedures
 - FEMA guidelines regarding temporary housing siting
 - Unified Land Development Code
 - Disaster temporary housing plan
 - Incorporate into priority redevelopment areas
 - Temporary sites transition into permanent uses
 - Procedures for permitting employer on-site temporary housing
 - Adopt overall temporary housing siting criteria
 - Annually update a listing of potential sites for different disaster scenarios
 - Post disaster coordination
- Funding assistance and insurance problems
 - Current policy & procedures
 - Florida hurricane deductibles
 - Florida legislature appropriations
 - Pre disaster education
 - Post disaster education
 - Assistance for renters
 - Individual rebuilding assistance & prioritization
 - Incentives for developers
- Non-conforming structures/substantial damage
 - Current policy & procedures
 - Substantial damage/improvement
 - Residential Substantial Damage Estimator
- Code enforcement and contractor licensing
 - Current policy & procedures
 - Contractor licensing
 - Code enforcement
- Available contractors and skilled construction workers
- Rebuilding enhanced and sustainable homes and neighborhoods
 - Current policy & procedures
 - Historic home repair
 - Protecting & restoring historic homes
 - Condemnation & demolition procedures
 - Hazard mitigation
 - Green building
 - Affordable housing redevelopment
 - Neighborhood preservation & gentrification
 - Removing & redeveloping blight



Public/Private Infrastructure and Facilities

- Security of critical infrastructure information
 - Current policy & procedures
 - PDRP policies
- Infrastructure services to priority redevelopment areas and other areas of new service resulting from redevelopment
 - Current policy & procedures
 - TECO policy
- Infrastructure services to interim redevelopment needs
 - Current policy & procedures
 - TECO policy
- Infrastructure and public facility repair
 - Current policy & procedures
 - TECO policies
- Communication and coordination among agencies, jurisdictions, and stakeholders

Economic Redevelopment

- Business resumption and retention
 - Pre-disaster business outreach/education
 - Identify most vulnerable industries & expected impacts
 - Post disaster business communication & assistance center
 - Supporting employees return to work
 - Post disaster financial assistance
 - Post disaster relocation & rebuilding assistance
 - Retention program & incentives
- Small business assistance
 - Bridge loan program
 - Post disaster financial assistance
 - Florida Business Continuity & Risk Management Program (BCRM)
 - Pre disaster survival planning & preparation
 - Post disaster counseling/training
- Addressing changes in market and workforce composition
 - Centrally located employment announcement
 - Employee counseling services
 - Workforce training
 - National emergency grants
- Tourism renewal
 - Marketing campaigns
 - Resumption of events
 - Maintain availability of accommodations & convention facilities
 - Outreach to national and international tourist industry
- Business replacement attraction/incentives
 - Market/recruit targeted industries with incentives
 - Workforce incentives



- Creative/flexible use of disaster funding
- Business incubators
- Community Redevelopment Agency and other economic/multi-use redevelopment projects
- FEMA ESF #14; National Disaster Recovery Framework

Land Use

- Prioritize areas to focus rebuilding, reconstruction, and redevelopment
 - Define priority redevelopment areas
 - Sustainable regional PRAs
 - Sustainable community PRAs
 - Vulnerable priority redevelopment areas
- Build-back standards
 - Current policy
 - Propose a unified build-back policy
 - Public education on build-back policy
- Develop policies for redeveloping land areas that have sustained repeated damages from storm events
 - Target areas for decreasing or mitigating development
 - Analyze target areas for best method of vulnerability reduction
 - Identify or create acquisition programs for hazard mitigation

Health and Social Services

Health and Medical

- Hospital, clinic, and medical office restoration
 - Facilities restoration
 - Systems restoration
 - Funneling resources to Existing Facilities
- Medical personnel retention and recruitment
- Mental health assistance
- Assisted living and nursing home safety
- Long-term assistance for special needs population
- Health-related pollution and environmental justice
- Community redevelopment from a “Healthy Communities” perspective

Safety and Security

- Public safety service levels reestablished throughout county
 - Coordinate Plans & Procedures
 - Reconsider facility locations
 - Extending the presence of responders during transition

Education

- Schools, higher education reopened
- Daycare, after-school, and teen programs restored
- Recreation, cultural activities restored



Social Services

- Public transportation restoration and improvement
- Children and family services
- Low-income assistance
- Homeless programs
- Coordination and assistance for nongovernmental organizations and volunteers

Environmental Restoration

- Hazardous materials, debris contaminants
 - Current policies & procedures
 - Facilities relocation
 - Disposal
 - Monitoring for environmental safety & easing public concern
- Environmental review of temporary sites
 - Current policy & procedures
 - Environmental testing
- Waterway debris removal, pollution
 - Current policy & procedures
- Wetland restoration
 - Current policy & procedures
 - Erosion stabilization
 - Sea level rise impacts on coastal landscape
- Habitat restoration on conservation lands
 - Current policy & procedures
- Urban forest restoration
 - Current policy & procedures
 - Pre disaster inventory, assessment, mitigation
 - Post disaster damage assessment, cleanup, and removal
 - Post disaster long-term canopy restoration, maintenance
- Environmental review of housing sites/neighborhoods
 - Current policy & procedures
 - Communicating with the public

Financial Administration

- Project revenue shortfalls
 - Revenue impact analysis
- Coordinate private and public funding
 - Assess staff levels & administrative procedures
- Pre-develop options for sustainably cutting services or finding other funding sources
 - Contingency planning
 - Research available funding sources
 - PDRP Funding Resources Companion Handbook*
 - Financial & Technical Assistance for Municipalities* (Florida League of Cities)



The Patchwork Quilt: A Creative Strategy for Safe and Long-term Post-Disaster Rebuilding

- Retain high bond ratings
 - Current policy & procedures
 - Debt management policy
 - Issuing bonds to meet match requirements
- Enforce equitable disaster assistance
- Modify purchasing and contracting procedures to expedite emergency purchases.
- Adopt a repair and reconstruction ordinance to facilitate use of FEMA public assistance dollars
- Establish an internal claims reimbursement process for FEMA funds.
- Adopt a local hazard mitigation plan as part of the general plan to facilitate access to additional FEMA funds.

Governance

- Sustaining governmental capacities and services in the face of economic crisis and staffing shortages
- Emergency financial management
- Mobilizing local and regional resources
- Maintenance of local control over recovery actions and priorities
- Securing and managing outside financial and non-financial assistance
 - Federal & State Assistance
 - Private Sector Assistance
- Municipal financial and non-financial assistance
 - Municipal insolvency/staff shortages
- Public Information

FUNDING & ASSISTANCE SOURCES FOR COMMUNITY REDEVELOPMENT

A broad range of pre and post disaster funding is available from local, state, federal, private sector, foundations and non-governmental sources that can be used to increase community disaster resilience as well as assist and facilitate post disaster recovery and redevelopment. It falls upon local officials to identify, understand and secure these funds to meet local needs. In many cases, especially where large or multiple events are involved, the County may be competing with other communities for the same monies and will need to distinguish itself as a good investment. Often valuable funding sources have been overlooked or sub-optimized by victimized communities because of a lack of information and poor preparation and planning.

It is critical that County and municipal staffs familiarize themselves with potential funding assistance sources. Ideally, this should be done in an unrushed, studied manner in a “blue skies” environment well before disasters threaten. In order to take full advantage of opportunities to secure and optimally benefit from assistance funding, it is recommended that local officials and staff establish pre-event relationships with key



funding organizations. Proactive partnering and conversations with these funding organizations provides the community with an understanding of the organization's policies, timelines, funding uses and restrictions, types of aid, and recipient and project eligibility.

Local governments may also be required to provide local matches under the rules of certain funding sources. Frequently these matches can be in the form of in-kind services. Some funding organizations might allow waivers of certain criteria or allow creative financing solutions depending on the type or magnitude of the disaster, so it is advisable to explore whether these options are available.

There are several useful lists of governmental and non-governmental disaster relief programs and sources for private donations that can support post-disaster redevelopment. Some of these include:

- *Financial Resource Companion to PDRP* (FDCA/FDEO)
<http://www.floridajobs.org/fdcp/dcp/PDRP/Files/ToolBox/FundingResourcesCompanionHandbook.pdf>
(A copy can be found in the Appendix C Section of this volume)
- *Disaster Assistance: A Guide to Recovery Programs* (FEMA pub 229)
www.fema.gov/pdf/rebuild/ltrc/recoveryprograms229.pdf
- *Financial and Technical Assistance for Florida Municipalities 2008-2009*
(Florida League of Cities)
<http://www.flcities.com/membership/grant/>

The first part of this section provides a listing of potential funding sources taken from the *Financial Resource Companion to PDRP* published by the Florida Department of Community Affairs (now administered by the Florida Division of Economic Opportunity in coordination with the Florida Division of Emergency Management. It provides funding resources that are available pre and post disaster for the following topical areas:

- Hazard Mitigation and Risk Reduction
- Individual Assistance
- Public Facilities and Infrastructure
- Emergency Management
- Environmental
- Economic Redevelopment
- Historic Preservation
- Agriculture
- Other

Also included is a listing extracted, in part, from FEMA's *Disaster Assistance: A Guide to Recovery Programs*. Although there is some overlap in the programs covered, it is recommended they be used in tandem to make decisions and take actions.

The second part of this section outlines some strategies and guidance for local officials responsible for securing funding for long-term recovery and redevelopment projects.

Before presenting the lists of potential sources, three lesser known, sources should be given special attention:

Florida Disaster Recovery Fund

The Florida Disaster Recovery Fund was originally founded in 2004 to provide assistance to hurricane victims for losses not covered by immediate recovery groups, insurance or government funding. The fund, managed by the Volunteer Florida Foundation, works with non-profit organizations in affected communities. Donations come from a variety of sources including corporations and private foundations. Goals of the Disaster Fund include:

- Stretching recovery dollars by providing needed financial assistance where insurance and government help leaves off
- Helping rebuild communities and lives by providing funds to help local organizations working in recovery and by helping non-profits and faith-based organizations rebuild their own structures so they can continue to assist in rebuilding communities

Potential Federal and State Recovery/Redevelopment Funding Sources

(Extracted from Disaster Assistance: A Guide to Recovery Programs and Other Sources)

The Federal Government helps States and localities to prepare for disasters by providing financial and technical assistance for emergency planning and training, conducting exercises of plans, and building and maintaining an emergency management infrastructure.

In a catastrophic or major disaster incident, the National Response Plan, a national approach to domestic incident management, will be activated. This interagency plan describes the resources that Federal agencies can mobilize to support initial emergency functions and how they will integrate with state, local, private sector, and non-governmental resources. It outlines planning assumptions, policies, a concept of operations, and organizational structures.

Disaster Assistance: A Guide to Recovery Programs supports the National Response Plan and the National Disaster Recovery Framework as a resource for Federal, State, local, and non-governmental officials. It contains brief descriptions and contact information for Federal programs that may be able to provide disaster recovery assistance to eligible applicants.

The programs described in the guide may all be of assistance during disaster incident recovery. Some are available only after a Presidential declaration of disaster, but others



are available without a declaration. Individual program descriptions are detailed in the Guide.

A Governor may request a Presidential declaration in the event of a disaster incident in which State and local emergency resources are overwhelmed. The request must satisfy the provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, which is the primary legislative authority for the Federal Government to assist State and local governments in carrying out their responsibilities for disaster response and recovery.

The Guide presents an array of programs that may be of assistance during disaster recovery, depending upon the circumstances, community needs, and available resources. Please verify the applicability of a particular program with the responsible agency.

The following table lists potential recovery assistance programs contained in the Guide.

Recovery Funding Assistance Programs

The following abbreviations are used throughout this matrix: Presidential declaration (PD); available without declaration (AWD); Federal agency (F); State agency (S); locality (L); individual/family (I); nonprofit organization (N); Indian Tribe (T); business (B); and not provided (N/P).

Program	Agency	Assistance Provided	Activating Mechanism	Eligibility
Emergency Haying and Grazing	Dept. of Agriculture (USDA), Farm Service Agency (FSA)	Emergency authority to harvest hay or to graze land devoted to conservation and environmental uses under the Conservation Reserve Program.	AWD	I/B
Emergency Loans	USDA, FSA	Low-interest loans to family farmers and ranchers for production losses and physical damage.	PD; designated by Secretary of Agriculture or Administrator, FSA (physical losses only).	I/B
Noninsured Crop Disaster Assistance Program	USDA, FSA	Direct payments to reduce financial losses resulting from a natural disaster that causes production loss or prevents planting of crops grown commercially for food or fiber, for which Federal crop insurance is not available.	AWD	I
Emergency Conservation Program	USDA, FSA	Cost-share payments to rehabilitate farmlands damaged by natural disasters and to carry out emergency water conservation or water-enhancing measures during times of severe drought, in cases when the damage or drought is so severe that Federal assistance is necessary.	AWD	I/B



Agricultural Marketing Transition Act (AMTA) Program	USDA, FSA	Direct payments to eligible producers of program crops that comply with AMTA requirements.	AWD	I/B
Conservation Reserve Program (CRP)	USDA, FSA	Voluntary program that offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland.	AWD	I/B
Farm Operation Loans	USDA, FSA	Loans and loan guarantees to be used for farm operating costs.	N/P	I
Farm Ownership Loans	USDA, FSA	Direct loans, guaranteed loans, and technical assistance for farmers in acquiring or enlarging farms or ranches; making capital improvements; promoting soil and water conservation; and paying closing costs.	AWD	I
Emergency Food Assistance (Emergency Food Stamp and Food Commodity Program)	USDA, Food and Nutrition Service (FNS)	Direct payments to States for specified uses.	PD; declaration by the Secretary of Agriculture.	S/I
Food Distribution	USDA, FNS	Donations of USDA-purchased food.	PD; declaration by Secretary of Agriculture and compliance with eligibility criteria.	F/S/L/N
Emergency Watershed Protection (EWP)	USDA, Natural Resources Conservation Service (NRCS)	Direct payments and technical assistance to install structural and nonstructural measures to relieve imminent threats to life and/or property, and to purchase floodplain easements. Technical assistance such as site evaluations, design work, and installation inspections also are provided through the program.	AWD; triggered by NRCS State Conservationist.	S/L/N/B/I
Water Resources	USDA, NRCS	Project grants for the installation of preventive measures such as dams, channels, flood warning systems, purchasing easements, floodplain delineation, and land treatment. Advisory and counseling services also are available.	N/P	S/L/N
Resource Conservation and Development (RC&D)	USDA, NRCS	Technical assistance and loans to finance local project costs. Projects may include land and water conservation, resource improvements, recreational development, and waste disposal projects.	AWD	L/N



River Basin Project	USDA, NRCS	Technical assistance. Special priority is given to projects designed to solve problems of upstream rural community flooding, water quality improvement that comes from agricultural nonpoint sources, wetlands preservation, and drought management for agricultural and rural communities. Special emphasis is placed on helping State agencies develop strategic water resource plans.	AWD; triggered by NRCS State Conservationist.	F/S/L
Soil Survey	USDA, NRCS	Technical assistance. Objective is to maintain up-to-date, published surveys (and soil survey data in other formats) of counties or other areas of comparable size for use by interested agencies, organizations, and individuals; and to assist in the use of this information.	N/P	S/L/N/B/I
Federal Crop Insurance Program	USDA, Risk Management Agency (RMA)	Direct payments of insurance claims. Insurance against unavoidable causes of loss such as adverse weather conditions, fire, insects, or other natural disasters beyond the producer's control.	No activating mechanism is needed, but availability is based on crop-specific sales, closing dates, and the availability of crops in particular counties.	I
Business and Industrial Loan Program (B&I)	USDA, Rural Business Service	Guaranteed and direct loans up to \$10 million. Possible disaster uses include drilling wells, purchasing water, or tying into other water programs.	AWD	B/N/T and public bodies
Farm Labor Housing and Grants	USDA, Rural Housing Service (RHS)	Loans and grants to provide housing and related facilities for domestic farmers.	No deadlines.	I/B
Rural Housing Site Loans	USDA, RHS	Loans for the purchase and development of housing and necessary equipment that becomes a permanent part of the development (e.g., water and sewer lines).	AWD	N
Rural Rental Housing Loans	USDA, RHS	Loans for the purchase, building, or repair of rental housing. Funds can also be used to provide water and waste disposal systems.	AWD	I/S/L/B
Emergency Community Water Assistance Grants (ECWAG)	USDA, Rural Utilities Service (RUS)	Project grants to help rural residents obtain adequate water supplies.	PD	S/L/N
Water and	USDA, RUS	Project grants and direct and	AWD	L/N/T



Waste Disposal Loans and Grants		guaranteed loans to develop, replace, or repair water and waste disposal systems in rural areas and towns having populations of 10,000 or less.		
Voluntary Organizations Recovery Assistance	American Red Cross, Mennonite Disaster Service, Salvation Army, and member organizations of the National Voluntary Organizations Active in Disaster	Mass care (shelter and feeding), welfare inquiries, health and mental health services, child care, home repairs (labor and funding), emergency communications, debris removal, burn services, cleaning supplies, personal property, distribution of supplies, transportation, loan personnel, and other specialized programs and services.	Disaster event.	I
Economic Adjustment Program — Disaster Economic Recovery Assistance	Dept. of Commerce (DOC), Economic Development Administration (EDA)	Planning and technical assistance grants to State and local governments for strategic recovery planning and implementation to focus on job retention/creation to help offset the economic impacts of a major disaster.	PD; requires supplemental appropriation (SA).	S/L/N/T
Economic Adjustment Program — Disaster Economic Recovery Assistance	DOC, EDA	Revolving loan fund grants to State and local governments to provide a source of local financing to support business and economic recovery after a major disaster where other financing is insufficient or unavailable.	PD; SA	S/L/N/T
Economic Adjustment Program — Disaster Economic Recovery Assistance	DOC, EDA	Infrastructure construction grants to address local recovery implementation needs for new or improved publicly owned infrastructure after a major disaster, support job creation and retention, leverage private investment, and help accelerate and safeguard the overall economic recovery of the disaster-impacted area.	PD; SA	S/L/N/T
Corporation for National Service (CNS) Programs	CNS	Volunteers of all ages/backgrounds provide short/long-term response and recovery assistance. They are available through the community or national deployment.	PD	F/S/N/T
Legal Services	FEMA	Free legal advice and referrals. Assistance includes help with insurance claims, counseling on landlord-tenant and mortgage problems, assistance with home repair contracts and consumer protection matters, replacement of legal documents, estate administration, preparation of guardianships and conservatorships, and referrals.	PD, designation for individual assistance.	I
National Flood Insurance Program (NFIP)	FEMA	Insurance benefits against losses from floods, mudflow, or flood-related erosion.	AWD	I/B/S



NFIP, Community Assistance Program	FEMA	Grants to States for technical assistance to resolve floodplain management issues.	AWD	S/L
Public Assistance Program	FEMA	Project grants. Funds can be used for clearing debris, emergency measures, and repairing or replacing damaged structures, roads, utilities, public buildings, and infrastructure.	PD, designation for public assistance.	L/N, via S
Disaster Housing Program	FEMA	Direct-payment grants and services. Grants include transient accommodation reimbursement, and home repair, rental, and mortgage assistance. Services may include a mobile home.	PD, designation for individual assistance.	I
Regulatory Relief for Federally Insured Financial Institutions	Federal Deposit Insurance Corporation (FDIC) and other Federal regulatory agencies	Specialized services. Supervisory agencies can grant regulatory relief to insured institutions. Regulatory relief includes lending assistance, extensions of reporting and publishing requirements, waivers from appraisal regulations, and implementation of consumer protection laws.	PD; other disaster that affects the ability of a federally insured financial institution to provide normal services.	N/B
Donation of Federal Surplus Personal Property	General Services Administration (GSA)	Donations of surplus personal property to eligible recipients.	N/P	S/L/N/ public airports.
Disposal of Federal Surplus Real Property	GSA	Sale, exchange, or donations of property and goods.	N/P	S/L/N
Disaster Assistance for Older Americans	HHS, Administration on Aging	Direct payments to State agencies focused on aging-related services.	PD	I, via S
Mental Health Disaster Assistance	HHS, Public Health Service	Project grants to provide emergency mental health and substance abuse counseling to individuals affected by a major disaster.	Supplemental appropriation by Congress relating to PD.	I, via S
Community Development Block Grant (CDBG) Program — Entitlement Grants	Dept. of Housing and Urban Development (HUD), Community Planning and Development (CPD)	Formula grants to entitlement communities. Preferred use of funding is for long-term needs, but funding may also be used for emergency response activities.	Supplemental appropriation by Congress relating to PD.	L
CDBG — State's Program	HUD, CPD	Formula grants to States for non-entitlement communities. Preferred use of funding is for long-term needs, but funding may also be used for emergency response activities. States establish methods of fund distribution.	Supplemental appropriation by Congress relating to PD.	L, via S
Mortgage Insurance for	HUD	Provides mortgage insurance to protect lenders against the risk of default on	PD	I

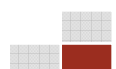


Disaster Victims Program (Section 203 (h))		loans to qualified disaster victims whose homes are located in a presidentially designated disaster area and were destroyed, requiring reconstruction/replacement. Insured loans may be used to finance the purchase or reconstruction of a one-family home that will be the principal residence of the homeowner.		
Reclamation States Emergency Drought Relief Act of 1991	Dept. of the Interior (DOI), Bureau of Reclamation	Loans, grants, use of facilities, construction, management and conservation activities, and purchase of water for resale or for fish and wildlife services. Temporary drought assistance may include the drilling of wells, installation of equipment, improved reporting of conditions.	Request for drought assistance and approval by Commissioner of Reclamation.	F/S/N/I
Disaster Unemployment Assistance (DUA)	Dept. of Labor (DOL); FEMA	Direct payments of DUA benefits and reemployment assistance services. Objective is to provide assistance to individuals who are ineligible for regular unemployment compensation programs and who are left jobless after a major disaster.	PD, designation for individual assistance. PD may be limited to DUA only.	I, via S
Employment: Job Training Partnership Act (JTPA), National Reserve Emergency Dislocation Grants	DOL, Employment and Training Administration	Program provides States with grant money to provide individuals with temporary jobs and/or employment assistance.	PD	I, via S
Price-Anderson Act	American Nuclear Insurers and Nuclear Regulatory Commission (NRC) (for commercial nuclear power plants); Dept. of Energy (for DOE facilities)	Payment of liability claims that arise from a nuclear power reactor accident. Insurance-provided assistance may compensate victims for increased living expenses after an evacuation, unemployment, business losses, environmental cleanup, reduced property values, and costs associated from bodily injury.	AWD	I
Price-Anderson Act	NRC	Insurance reimburses States and municipalities for costs necessarily incurred in providing emergency food, shelter, transportation, or police services in evacuating the public after a nuclear power reactor accident.	AWD	S/L
Economic Injury Disaster Loans (EIDLs)	Small Business Administration (SBA)	Direct long-term, low-interest loans to small businesses and agricultural cooperatives. Loans are only available to applicants with no credit available elsewhere, and the maximum amount of an EIDL is \$1.5	PD; declaration of a disaster by the Secretary of Agriculture and/or SBA-declared	B

		million.	disaster.	
Physical Disaster Loans (Business)	SBA	Direct long-term, low-interest loans to businesses and nonprofit organizations. Loans provided to repair or replace uninsured property damages caused by disasters. Loans limited to \$1.5 million.	PD or SBA declaration.	N/B
Physical Disaster Loans (Individual)	SBA	Direct long-term, low-interest loans to homeowners and renters to repair or replace uninsured damages caused by disasters to real and personal property. Loan amounts limited to \$200,000 to repair or replace real estate, and to \$40,000 to repair or replace personal property.	PD or SBA declaration.	I
Social Security Assistance	Social Security Administration (SSA)	Advisory and counseling services to process SSA survivor claims, assist in obtaining necessary evidence for claim processing, resolve problems involving lost or destroyed SSA checks, and reprocess lost or destroyed pending claims.	PD; AWD	I
International Donations	Dept. of State	Donations including goods and cash.	Request for international coordination assistance from FEMA's Donations Coordinator.	I
Transportation: Emergency Relief Program	Dept. of Transportation (DOT), Federal Highway Administration (FHWA)	Formula and project grants to repair roads. FHWA can provide: (1) up to \$100 million in funding to a State for each natural disaster or catastrophic failure; and (2) up to \$20 million in funding per year for each U.S. territory. Special legislation may increase the \$100 million per State limit.	PD; AWD	F/S
Alcohol and Tobacco Tax Refund	Dept. of the Treasury, Bureau of Alcohol, Tobacco, and Firearms	Specialized services to provide Federal alcohol and tobacco excise tax refunds to businesses that lost assets in a disaster.	PD	B
Savings Bonds Replacement or Redemption	Treasury, Bureau of Public Debt	Specialized services. Bureau of Public Debt expedites replacement of U.S. Savings Bonds lost or destroyed as a result of a disaster.	PD	I
Taxes: Disaster Assistance Program	Treasury, Internal Revenue Service (IRS)	Advisory and counseling services. IRS provides information about casualty loss deductions, claim procedures, and reconstruction of lost financial records.	PD	I/B
Forbearance on VA Home Loans	Dept. of Veterans Affairs (VA)	Encourage lenders to extend forbearance to any borrowers who have VA home loans and who are in distress as a result of disaster; provide incentives to such lenders.	PD	I



Coastal Zone Management; Hazards, Environmental Recovery, and Mitigation	DOC, National Oceanic and Atmospheric Administration (NOAA)	Assistance to State and local governments in mitigation and recovery/restoration planning, post event permitting assistance, water-level data for storm-surge and flooding prediction and mitigation.	PD for post event; AWD from coastal State(s) for pre-event planning.	S
DOC, NOAA	Provision of survey mark data to local and State agencies for re-establishing their geodetic control networks; re-establishment of national network if warranted.	Re-establishing Local Survey Networks	PD; AWD depending on funding availability.	
DOC, NOAA	Grants to States for the management of coastal development to protect life and property from coastal hazards.	Coastal Zone Management Administration Awards	AWD requires supplemental appropriation by Congress relating to PD for poststorm coastal hazard mitigation and recovery activities.	
DOC, NOAA	Emergency grants to State coastal zone management agencies to address unforeseen or disaster-related circumstances.	Coastal Zone Management Fund	AWD subject to amounts provided in appropriation acts. No funds currently appropriated.	
DOC, NOAA, National Weather Service	Technical assistance for weather, water, and climate warning systems and critical information dissemination systems. Post storm data acquisition activities.	Technical Support	AWD	
Technical Support	DOC, National Institute of Standards and Technology	Disaster damage surveys, assistance in procurement of consulting services, evaluation of structural and fire performance of buildings and lifelines.	Federally declared disasters to buildings and lifelines, on cost-reimbursable basis.	



Potential Federal and State Recovery/Redevelopment Funding Sources

Agency/Program/ Information Link	Description of Assistance
Individual Assistance http://www.fema.gov/rrr/inassist.shtm	Individual Assistance programs assist people and businesses following a disaster and help them get back on their feet.
Public Assistance http://www.fema.gov/rrr/pa	The Public Assistance Program provides supplemental federal disaster grant assistance to help state and local governments and certain private non-profit organizations rebuild. FEMA's Public Assistance Grant Program is one way federal assistance gets to the state and local governments and to certain private nonprofit organizations. These grants allow them to respond to disasters, to recover from their impact and to mitigate impact from future disasters. While these grants are aimed at governments and organizations -- their final goal is to help a community and all its citizens recover from devastating natural disasters.
FEMA Regional Support http://www.fema.gov/regions	Regional FEMA staff work directly with states to help plan for disasters, develop mitigation programs, and meet needs when major disasters occur.
National Flood Insurance Program Increased Cost of Compliance Coverage (ICC) http://www.fema.gov/nfip/icc.shtm	Owners of homes and businesses damaged by a flood, may be required to meet certain building requirements in your community to reduce future flood damage before you repair or rebuild. To help you cover the costs of meeting those requirements, the National Flood Insurance Program (NFIP) includes Increased Cost of Compliance (ICC) coverage for all new and renewed Standard Flood Insurance Policies.
Flood Mitigation Assistance (FMA) http://www.fema.gov/fima/fma.shtm	FMA, through the National Flood Insurance Fund, 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 National Flood Insurance Program.
Hazard Mitigation Grant Program (HMGP) http://www.fema.gov/fima/mitgrant.shtm	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the Hazard Mitigation Grant Program (HMGP) administered by the Federal Emergency Management Agency (FEMA) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.
Pre-Disaster Mitigation (PDM) Grant Program http://www.fema.gov/fima/pdm.shtm	The Pre-Disaster Mitigation (PDM) program was authorized by §203 of the Stafford Act. Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist States and local governments (to include Indian Tribal governments) in implementing cost-effective hazard mitigation activities that complement a comprehensive

	mitigation program. The PDM program will provide funds to states, territories, Indian tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
Economic Development Administration (EDA) http://www.fema.gov/fima/pdm.shtm	The Economic Development Administration (EDA) helps distressed communities address problems associated with long-term economic distress, as well as sudden and severe economic dislocations including recovering from the economic impacts of natural disasters, the closure of military installations and other Federal facilities, changing trade patterns, and the depletion of natural resources.
Environmental Protection Agency (EPA) http://www.epa.gov	The U.S. Environmental Protection Agency (EPA) was established to protect human health and the environment. EPA leads the nation's environmental science, research, education and assessment efforts.
Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) http://www.nrcs.usda.gov	The National Resources Conservation Service (NRCS) provides planning assistance for watershed protection projects, water quality improvement projects, wetland preservation, and management for agricultural and rural communities.
Department of Agriculture (USDA) Rural Development Assistance http://www.rurdev.usda.gov	The Rural Development (RD) agency of USDA helps rural areas to develop and grow by offering Federal assistance that improves quality of life. Rural Development provides financial programs to support essential public facilities and services as water and sewer systems, housing, health clinics, emergency service facilities and electric and telephone service. Rural Development also promotes economic development by providing loans to businesses through banks and community-managed lending pools, while also assisting communities to participate in community empowerment programs.
Housing & Urban Development (HUD) Community Development Block Grants (CDBG) http://www.hud.gov	Community Development Block Grants (CDBG) are administered by State community development agencies and local governments on the behalf of the U.S. Department of Housing and Urban Development (HUD) to provide decent housing and a suitable living environment, principally for low-to-moderate income individuals. CDBG activities may include the acquisition, rehabilitation, and reconstruction of disaster-damaged properties and the redevelopment of disaster-affected neighborhoods.
National Oceanic & Atmospheric Administration (NOAA) http://www.noaa.gov	Within NOAA, the Office of Ocean and Coastal Resource Management (OCRM) is responsible for administering the Coastal Zone Management Act and a leader on the Nation's coastal, estuarine and ocean management issues.
Small Business Administration	The Small Business Administration (SBA) provides

(SBA) http://www.sba.gov/disaster_recov/index.html	low-interest disaster assistance loans for the repair or replacement of a primary residence; household and personal property; and for business owners and non-profit organizations for the repair, rehabilitation, or replacement of property.

State and Key Outside Economic Redevelopment Organizations/Agencies

OTTED Office of Trade & Tourism Development	1. Participates in agency network conference calls pre- and post- event. 2. Initiates pre-event contact with all OTTED partners to ensure correct identification of projected needs for response. 3. If needed, initiates contract and budget amendment preparation for Loan Program implementation. 4. Executes contract(s) with administrative entities. 5. Coordinates Office-specific and partner-specific media releases. 6. Conducts local training for participants implementing the loan program 7. Schedules and conducts loan committee meetings. 8. Generates appropriate reports on loan activity. 9. Coordinates assistance to businesses regarding permitting and regulatory issues through Economic Development Liaisons. 10. Assists in staffing the State ESF-18.
Agency for Workforce Innovation	1. Provides labor market information and census data. 2. Mobilizes agency's One-Stop Mobile Units 3. Initiates the disaster unemployment assistance program, if deemed appropriate. 4. Operates the national emergency grants jobs program, if deemed appropriate. 5. Assists with labor exchange – matching workers with employers 6. Assists in staffing the State ESF 18. 7. Participates in post disaster economic recovery workshops. 8. Coordinates the delivery of intermediate and long term economic impact statements
Department of Agriculture and Consumer	1. Provides applicable information about



Services	agricultural sectors. - Assists in coordinating with agricultural associations. - Assists with the development of any recovery program guidelines relating to agricultural producers. - Identifies applicable program(s) that will aide Florida's agricultural sectors. - Participates in business assistance workshops and business assistance centers, as needed. - Coordinates with the Palm Beach County Extension Service on relief and recovery - Provides outreach to agency stakeholders. - Assists in staffing the State EOC. - Participates in the development of intermediate and long term economic impact statements.
Department of Business and Professional Regulation (DBPR)	- Participates in public forums to provide information and assistance to businesses and professionals. - After an event, assists with the economic disaster assessment process. - Provides outreach to professions and businesses before, during and after an event. - Assists in staffing the ESF 18. - Assists with dispute resolution related to our licensed businesses and professions.
Department of Financial Services	- Provides education on insurance and financial issues - Provides assistance with insurance contacts (short term recovery) - Monitors insurance and banking industries response in providing services. - Assists with financial disputes resolution relating to banking or insurance issues. - Provides information to the business community on insurance companies, adjustors and agent information. - Identifies fraud and insurance trade/claim practice violations. - Continues outreach with the business community. - Participates in post disaster economic recovery workshops, business recovery centers, etc. - Provides outreach to agency stakeholders. - Assists in staffing the ESF 18. - Participates in the development of intermediate and long term economic impact statements.
Department of Management Services	Provides services and support in the areas of human resource management, retirement



	benefits, health benefits, real-estate management, specialized services, state purchasing and technology.
Department of Revenue	1. Assists in staffing the State EOC. 2. Participates in the development of intermediate and long term economic impact statements. 3. Participates in post disaster economic recovery workshops, business recovery centers, etc.
Enterprise FL	1. Coordinates pre- and post- event conference calls with local economic development and business support partners to maximize input on damage assessment, need identification, and resource delivery. 2. Coordinates business impact and damage assessment. 3. Assists local economic development organizations compile information necessary to request implementation of Loan Program, including legislative letters of request, Business Recovery Surveys, and media releases. 4. Coordinates resources for establishment of small business assistance centers and/or workshops. 5. Assists in implementation of Loan Program. 6. Identifies/helps coordinate assignment of volunteer staff from economic development partners to affected organizations. 7. Locates sources of equipment needed by affected economic development organizations or business groups to assist recovery efforts. 8. Assists local economic development organizations or major employers needing immediate assistance for displaced workers. 9. Assists local economic development organization or major employers identify short- and long- term employment needs. 10. Assists in staffing the State ESF 18. 11. Participates in the development of intermediate and long term economic impact statements.
Small Business Development Centers Network	1. Coordinates statewide pre- and post- event workshops for educating and training businesses in disaster preparation, continuity planning and recovery. 2. Supports development and training of a pool of qualified Florida businesses capable of responding to public and private sector needs (products and services) and contract solicitations. 3. Works with the Dept. of Management



	Services to enhance the pool of "certified" businesses listed on myfloridamarketplace.com - Deploys Mobile Assistance Centers (MACs) and teams of Business Recovery SBDC analysts to affected communities. - Provides technical assistance for economic business damage assessments. - Provides technical assistance and communication linkages between SEOC and affected business communities through the MACs satellite communications capability. - Provides assistance to affected businesses in the preparation for state and SBA loan applications.
Visit Florida	- Provides outreach via web site, visitor hotline and welcome centers. - Coordinates pre-and post- event conference calls with tourism and industry partners. - Maintains tourism-marketing opportunities before, during and after the event. - Coordinates with Visit Florida partners to identify temporary lodging and housing for evacuees or others displaced by the event and emergency responders. - Provides information for reports - Assists in staffing the EOC. - Participates in the development of intermediate and long term economic impact statements.
Volunteer Florida	Works with local long-term recovery organizations to ensure private donations are targeted to areas of need.
Workforce Florida	- Coordinates with Regional Workforce Boards to identify impact on local employers and employees. - Identifies opportunities to assist impacted employers and employees with training programs to support recovery. - Assists in staffing the State EOC.
Associated Industries of Florida	Supports economic redevelopment through its membership.
Florida Chamber	Supports local business interests through its extensive pool of legislative, grassroots, and political tools.
Florida Council of 100	Works with the Governor's Office, Chief Justice, and Legislature to support economic redevelopment.
Florida Restaurant & Lodging Association	Represents interests of the hospitality industry through its local chapters and state organization.
Florida Retail Federation	- Provides ESF18 staffing assistance. - Provides outreach vial Web site and member industry communications. - Coordinates communication between SEOC (State ESF 7 Logistics) and Florida retailers.

	4. Trouble-shoots for priority retailers of essential commodities.
National Federation of Independent Businesses	1. Represents interests of small and independent businesses and professional practices at the state and federal levels.

Engaging Private Sector Resources in Community Recovery

After decades of oversight and inaction, the need for engaging the private sector in community disaster recovery is now widely recognized and being acted upon at all levels of government and by the private sector.

The primacy of early engagement of local and regional business resources and capabilities is critical to economic redevelopment, reestablishment of critical services, and quality of life. State resources and capabilities are the second line of defense, capable of leveraging established relationships with key private sector organizations, contractors, and federal agencies. The National Disaster Recovery Framework and national private sector organizations such as the U.S. Chamber of Commerce's Business Civic Leadership Center provide access to a broad range of government and private sector assistance and resources. FEMA's Private Sector Office is also a valuable source of information on private sector engagement.

Following are some key resources to be considered following major disasters to engage private sector resources and capabilities in community resilience and recovery.

Local/Regional/State Resources:

Business and Industry Unit (ESF 18)

The purpose of the ESF 18 is establishing productive working relationships between local government and the business community that can facilitate disaster resilience and recovery. The ESF #18 desk in the EOC is staffed by private sector and government agency personnel with private sector interests during Level 4 activations. During long-term recovery most, if not all of the ESF #18 staff will assume recovery roles at the Recovery Operation Center.

Contacts:

Business & Industry Unit Leader (ESF #18 Coordinator), Division of Emergency Management (561)-712-6325, or
Director of Emergency Management (561)-712-6400
ESF #18 Desk (Activations Only)

Business Development Board

The mission of the Business Development Board is to stimulate economic energy, promote business diversity and enrich the vitality of Palm Beach County through relocation, retention and expansion of companies to the area. Among its post disaster services is coordination with Enterprise Florida and other state agencies for bridge loans and other assistance grants/services.

Contact:

President & CEO (561) 835-1008

V.P. Business Retention and Expansion (561) 835-1008 Ext. 4108

Palm Beach County Private-Public Partnership

Palm Beach County's Private-Public Partnership has a stated vision is to ensure safe, resilient communities for the residents and businesses of Palm Beach County." Its mission is to strengthen the capacity of the county to prevent, prepare for, respond to, and recover from disasters through public-private collaborative and private-sector led resilience and recovery initiatives.

Contact:

Co-Chairs of the Executive Committee: (561) 400-6175; (561) 893-2486
EOC Liaison: (561) 712-6325

South Florida Disaster Resiliency Coalition

The South Florida Disaster Resiliency Coalition is a regional partnership comprised of Palm Beach County, Broward, Miami-Dade and Monroe county business, government and NGO representatives committed to community resiliency and engagement of private sector resources and capabilities in post disaster recovery and redevelopment.

Contacts:

Palm Beach County - Sheridan "Butch" Truesdale (DEM) 561-712-6325
Broward County - Gary Friedman (EM) 954-831-3345
Miami-Dade – Paul Vitro (EM) 305-468-5423
Chair: Tom Serio 561-758-6306

FDEM Office of Private Sector Coordination

Contact: John M. Cherry Private Sector Coordinator 850-922-5423

State ESF #18

The purpose of Emergency Support Function (ESF) 18 is to coordinate local, state and federal agency actions that will provide immediate and short-term assistance for the needs of business, industry and economic stabilization, and to support SERT efforts by facilitating and coordinating the delivery intermediate and long term economic recovery assistance.

Coordination of local, state and federal business assistance is done primarily through networks of local and regional economic, workforce and tourism development partners, as well as business support organizations who determine the most efficient and effective ways to manage the access to these services at the local and regional level.

The coordination of state agencies and organizations involved in assisting local economic development, workforce, tourism and other business support agencies and organizations includes the performance of tasks related to preparedness, response, recovery and mitigation where local resources are not sufficient and local government requests state assistance.

Contacts:

State ESF #18 Coordinator:
State Emergency Management Operations Center (SEOC):
Governor's Office of Tourism, Trade and Economic Development (OTTED):
Florida Department of Revenue (DOR):

Small Business Development Center (SBDC) at Palm Beach State College

The Small Business Development Center (SBDC) at Palm Beach State College is part of a national network that has more than 1,100 business development centers nationwide and is a member of the Florida SBDC Network and ASBDC. SBDCs represent the largest service delivery network of the U.S. Small Business Administration.

The SBDC is a cooperative effort of the private sector, the educational community and federal, state and local governments. It enhances economic development by providing small businesses with management and technical assistance, including assistance during post disaster recovery.

Contact: (561) 862-4726 sbdc@palmbeachstate.edu

Enterprise Florida

Enterprise Florida Inc. (EFI) is a public-private partnership serving as Florida's primary organization devoted to statewide economic development.

Florida's disaster response programs serve as a model for the nation. Preparation and planning are key elements in keeping Florida open for business after a disaster. Enterprise Florida provides a list of state and federal resources available for businesses to utilize in recovery activities:

Florida's Emergency Management Division (FDEM) annually updates a statewide Comprehensive Emergency Management Plan (CEMP) with the goal that Florida's citizens and businesses receive state of the art assistance during and after an emergency.

Florida Emergency Small Business Bridge Loan Program State of Florida Emergency Bridge Loan Program from the State of Florida. \$25,000 in short term 0% interest loans for 90 to 180 days for businesses to use while waiting for insurance or other assistance.(850) 681-3601

Florida Small Business Recovery Grant Program (AWI) Agency for Workforce Innovation

Florida Small Business Recovery Grants provide up to \$5,000 to approved businesses that are unable to maintain operation and keep their workers employed due to a natural disaster. A business must have 25 or fewer employees, have been in existence for at least 12 months prior to the disaster, established an unemployment compensation account and have more or more employees unable to work as a result of the disaster.

(850) 245-7193

Florida Short Time Compensation for Employers Program (AWI) Agency for Workforce Innovation

Short Time Compensation (STC) is a temporary alternative work style that will assist employers in keeping their work force intact. The program permits prorated unemployment compensation benefits to employees whose work hours and earnings are reduced as part of an STC plan to avoid total layoff of some employees.

(850) 921.3253

Florida Disaster Unemployment Assistance (AWI) Agency for Workforce Innovation

Unemployment benefits for individuals unemployed as a result of the disaster that are not covered by regular state or private unemployment insurance. Applicants have 30 days to file after the disaster is announced.

(800) 204-2418 www.fluidnow.com

Florida Mobile Business Assistance Unit (AWI) Agency for Workforce Innovation

The Mobile Unit is a self-contained vehicle equipped with state-of-the-art telecommunications equipment capable of being deployed inside or outside of the vehicle. The Mobil Unit has the capability to provide a full range of employment, reemployment and Unemployment Compensation services. It is a command type vehicle, 40 feet long with a 35 foot long custom built work area. Procedures and scheduling forms can be found on the website: (866) 352-2345 www.floridajobs.org/workforce/mobile_default.html

Florida Small Business Resource Network

The Small Business Continuity Services Resource Network (SBCSRN) is a database of Florida identified to fill niche areas for recovery technical assistance in support of small business and the Florida economy.

(904) 620-2489 www.sbrn.org

Florida Department of Agriculture and Consumer Services

License, insurance and consumer complaint information on building contractors.

(800) 435-7352 doacs.state.fl.us

Florida Department of Environmental Protection

An order can be given to reduce regulatory processes and provide flexibility for restoring services quickly during a disaster.

(850) 245-2118 - www.floridadep.org

Florida Department of Insurance

Provides Small Business Insurance information assistance.

(850) 922-3132 - www.dol.state.fl.us

Florida Department of Management Services

Florida Emergency Network Secure site

Logs in for State agencies, EOC offices, City, and County to order supplies during a declared emergency.

Dms.myflorida.com/fensecure

The Florida Emergency Supplier Network (Vendors):

Identifies and groups needed commodities and services by type and/or distribution channel, based on experience. Coordinate suppliers of emergency commodities and services for membership in the FESN. Also collect and organize the information and make it accessible to government buyers during emergency operations

dms.myflorida.com/fesn

The Florida Emergency Purchasing Network (Volunteers)

Coordinates purchasing volunteer efforts during declared emergencies, organizes the delivery of specialized training through the division of Emergency Management. Also collects and organizes FEPN information and make it accessible to emergency logistics officials requiring procurement assistance during emergency operations.

Dms.myflorida.com/fesn

Florida Department of Revenue

The Florida Department of Revenue will waive penalties and interest during the period of emergency for taxpayers who are unable to file returns and/or make payment of taxes on time.

(800) 352-3671 sun6.dms.state.fl.us/dot/

Visit Florida

Visit Florida adopts complimentary Cover Your Event (CYE) Insurance. This supplemental insurance covers any costs directly related to re-booking a meeting should it be displaced due to a named hurricane/disaster.

(850) 205-3800 www.meetings.visitflorida.com/cms/d/contact_us.php

FEMA Private Sector Division

FEMA established a Private Sector Division within the Office of External Affairs in October 2007. The division's overarching goals include improving information sharing and coordination between FEMA and the private sector during disaster planning, response and recovery efforts. The FEMA Private Sector Division cultivates public-private collaboration and networking in support of the various roles the private sector plays in emergency management, including: impacted organization, response resource, partner in preparedness, and component of the economy. The division also fosters internal collaboration and communication among FEMA programs that have an interest in private sector engagement.

Region IV Private Sector Contact (Atlanta): Philip Strouse
(404) 909-2641

Contact: FEMA's Private Sector Representatives directly:

During Disasters
ESF-15 Private Sector Desk
National Response Coordination Center (NRCC)
FEMA-NRCC-Private-Sector@dhs.gov

Non-Disaster
FEM Private Sector Representative
FEMA Private Sector Division
FEMA-PSR@FEMA.gov

Direct contact to FEMA Private Sector Division (Daniel Stoneking - Director):

FEMA-Private-Sector-Web@dhs.gov (202) 646-2925

Business Civic Leadership Center (U.S. Chamber of Commerce)

BCLC's Disaster Response and Recovery Program helps businesses communicate and collaborate with each other and with the nonprofit and government sectors to make disaster relief, recovery, and reconstruction activities more effective. With a focus on community resilience before disasters and long-term economic recovery afterwards, the program is a mechanism for sharing the latest ideas on disaster assistance, practicing recovery plans, highlighting the good work of corporate citizens, and helping to rebuild the livelihoods of people affected by extreme events.

BCLC's National Disaster Help Desk for Business (Supported by the Office Depot Foundation) is designed to enhance community economic recovery after a disaster. The Help Desk provides on-the-ground coordination of information among businesses, local chambers of commerce, NGOs, government responders, and disaster recovery specialists.

After a major disaster, contact the Help Desk if: You are in the impact area and want help with FEMA, SBA, and other assistance programs (or for international disasters, if you want help coordinating with U.S.-based NGOs and U.S. government aid agencies); you want information about recovery best practices; you want to support the recovery process and connect with chambers or businesses in the impact area.

BCLC's Jobs4Recovery is a free service provided by the Chamber BCLC and IBM, powered by the Direct Employers Association. It provides access to job opportunities in the affected communities that are grappling with the economic crisis and striving for economic recovery, as well as geographies that are severely affected by natural disasters'

BCLC also provides an online corporate aid tracker.

Contact: Gerald McSwiggan, Senior Manager BCLC Disaster Assistance & Recovery Program
(202) 550-0298 bclc@uschamber.com

Stephen Jordan, Senior VP & Executive Director (202) 463-3133

National Disaster Recovery Framework (NDRF)

Issued by the Department of Homework February 5, 2010, the *National Disaster Recovery Framework* is a guide that enables effective recovery support to disaster-impacted States, Tribes, Territorial and local jurisdictions. It provides a flexible structure that enables disaster recovery managers to operate in a unified and collaborative manner. It also focuses on how best to restore, redevelop and revitalize the health, social, economic, natural and environmental fabric of the community and build a resilient Nation.

For the first time, the National Disaster Recovery Framework defines:

- core recovery *principles*,
- *roles and responsibilities* of recovery coordinators and other stakeholders,
- a *coordinating structure* that facilitates communication and collaboration among all stakeholders, guidance for pre- and post-disaster recovery *planning* and;
- the overall process by which communities can capitalize on opportunities to rebuild stronger, smarter and safer.

The National Disaster Recovery Framework introduces six new Recovery Support Functions that provide a structure to facilitate problem solving, improve access to

resources, and foster coordination among State and Federal agencies, nongovernmental partners and stakeholders. Each Recovery Support Function has coordinating and primary Federal agencies and supporting organizations that operate together with local, State and Tribal government officials, nongovernmental organizations (NGOs) and private sector partners.

The framework identifies and recommends three new recovery positions designed to allow for more concentrated focus on community recovery. These positions include a Federal Disaster Recovery Coordinator (when warranted in large-scale or catastrophic disasters), State/Tribal Disaster Recovery Coordinators and Local Disaster Recovery Managers.

The framework incorporates whole community values, with emphasis on core principles, such as individual and family empowerment and partnership and inclusiveness. The National Disaster Recovery Framework outlines how important state, local and tribal leadership and participation of community members in decision-making and coordinated engagement of a wide array of supporting organizations is critical for successful recovery.

Palm Beach County recognizes that the engagement of the private sector is critical to enhancing community and business survival/retention rates and to effectively utilizing local and regional business resources and capabilities in support of community disaster recovery and economic redevelopment.

More details on program NDRF characteristics and the responsibilities of the three new leader functions are contained in Appendix B.

At this writing, the primary contact on NDRF matters is:

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Federal Agencies & Assistance Programs/Services

Agency/Program/ Information Link	Description of Assistance
Individual Assistance http://www.fema.gov/rrr/inassist.shtm	Individual Assistance programs assist people and businesses following a disaster and help them get back on their feet.
Public Assistance http://www.fema.gov/rrr/pa	The Public Assistance Program provides supplemental federal disaster grant assistance to help state and local governments and certain private non-profit organizations rebuild. FEMA's Public Assistance Grant Program is one way federal assistance gets to the state and local governments and to certain private nonprofit organizations. These grants allow them to respond to disasters, to recover from their impact and to mitigate impact from future disasters. While these grants are aimed at governments and organizations -- their final goal is to help a community and all its citizens recover from devastating natural disasters.
FEMA Regional Support http://www.fema.gov/regions	Regional FEMA staff work directly with states to help plan for disasters, develop mitigation programs, and meet needs when major disasters occur.
National Flood Insurance Program Increased Cost of Compliance Coverage (ICC) http://www.fema.gov/nfip/icc.shtm	Owners of homes and businesses damaged by a flood, may be required to meet certain building requirements in your community to reduce future flood damage before you repair or rebuild. To help you cover the costs of meeting those requirements, the National Flood Insurance Program (NFIP) includes Increased Cost of Compliance (ICC) coverage for all new and renewed Standard Flood Insurance Policies.
Flood Mitigation Assistance (FMA) http://www.fema.gov/fima/fma.shtm	FMA, through the National Flood Insurance Fund, 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 National Flood Insurance Program.
Hazard Mitigation Grant Program (HMGP) http://www.fema.gov/fima/mitgrant.shtm	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the Hazard Mitigation Grant Program (HMGP) administered by the Federal Emergency Management Agency (FEMA) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.
Pre-Disaster Mitigation (PDM) Grant Program http://www.fema.gov/fima/pdm.shtm	The Pre-Disaster Mitigation (PDM) program was authorized by §203 of the Stafford Act. Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist States and local governments (to include Indian Tribal governments) in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. The PDM program will provide funds to states, territories, Indian tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
Economic Development Administration	The Economic Development Administration (EDA) helps distressed communities address

Agency/Program/ Information Link	Description of Assistance
(EDA) http://www.fema.gov/fima/pdm.shtm	problems associated with long-term economic distress, as well as sudden and severe economic dislocations including recovering from the economic impacts of natural disasters, the closure of military installations and other Federal facilities, changing trade patterns, and the depletion of natural resources.
Environmental Protection Agency (EPA) http://www.epa.gov	The U.S. Environmental Protection Agency (EPA) was established to protect human health and the environment. EPA leads the nation's environmental science, research, education and assessment efforts.
Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) http://www.nrcs.usda.gov	The National Resources Conservation Service (NRCS) provides planning assistance for watershed protection projects, water quality improvement projects, wetland preservation, and management for agricultural and rural communities.
Department of Agriculture (USDA) Rural Development Assistance http://www.rurdev.usda.gov	The Rural Development (RD) agency of USDA helps rural areas to develop and grow by offering Federal assistance that improves quality of life. Rural Development provides financial programs to support essential public facilities and services as water and sewer systems, housing, health clinics, emergency service facilities and electric and telephone service. Rural Development also promotes economic development by providing loans to businesses through banks and community-managed lending pools, while also assisting communities to participate in community empowerment programs.
Department of Energy (DOE) Technical Assistance Program http://www.energy.gov/engine/content.do	The Technical Assistance Program provides services to communities for the revitalization of single-family, multifamily, and commercial buildings
Department of Energy (DOE) Center for Excellence for Sustainable Development http://www.sustainable.doe.gov	The Department's Center for Excellence for Sustainable Development, works with communities to help them define and implement sustainable development strategies as part of their comprehensive community planning efforts.
Department of Transportation (DOT) Transportation Enhancement Funding http://www.enhancements.org	The U.S. Department of Transportation's Federal Highway Administration (FHWA) oversees a special fund, known as Transportation Enhancement Funding, used to encourage States to dedicate transportation money to projects that enhance local communities.
Housing & Urban Development (HUD) Community Development Block Grants (CDBG) http://www.hud.gov	Community Development Block Grants (CDBG) are administered by State community development agencies and local governments on the behalf of the U.S. Department of Housing and Urban Development (HUD) to provide decent housing and a suitable living environment, principally for low-to-moderate income individuals. CDBG activities may include the acquisition, rehabilitation, and reconstruction of disaster-damaged properties and the redevelopment of disaster-affected neighborhoods.
National Oceanic & Atmospheric Administration (NOAA) http://www.noaa.gov	Within NOAA, the Office of Ocean and Coastal Resource Management (OCRM) is responsible for administering the Coastal Zone Management Act and a leader on the Nation's coastal, estuarine and ocean management issues.
Small Business Administration (SBA) http://www.sba.gov/disaster_recov/index.html	The Small Business Administration (SBA) provides low-interest disaster assistance loans for the repair or replacement of a primary residence; household and personal property; and for business owners and non-profit organizations for the repair, rehabilitation, or replacement of property.

GLOSSARY

Acceptable Risk: Degree of human and material loss that is perceived by the community or relevant authorities as tolerable in actions to minimize disaster risk. (U.N., 1992)

Accommodation: A sea level rise adaptation strategy wherein coastal jurisdictions choose not to retreat but rather to continue to use areas that will be impacted by hurricane storm surge increased by sea level rise. Planners may wish to reconsider construction standards and more appropriate uses. Other accommodation strategies may include converting land use to uses that are water dependent, adaptable, or evolve as sea levels rise.

Adaptation: Actions taken to help communities and ecosystems moderate, cope with, or take advantage of actual or expected changes in weather and climate conditions. (Modified from IPCC, 2007)

Adaptation Action Areas: Florida Statutes Chapter 163.3177(6) (g) (10) states that local communities may develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. Local governments that adopt an Adaptation Action Area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high tide events, storm surge, flash floods, stormwater runoff, and related impacts of sea level rise. Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge.

Adaptation Strategies: Strategies for adapting to sea level rise, most commonly involving actions in one or more categories of protection, accommodation and retreat.

Catastrophic Disaster: Any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions.” It produces an overwhelming demand on State and local response resources and mechanisms; causes a severe long-term effect on general economic activity; and severely affects State, local, and private sector capabilities to begin and sustain response activities.

Catastrophe: Quarantelli’s 6 criteria:

- In catastrophes most or all of a community built structure is impacted, including facilities of emergency response organizations.
- Local response personnel are unable to assume normal roles due to losses of personnel and/or facilities & equipment.

- Help from nearby or even regional communities is not available because all are affected by the same event.
- Most, if not all, of the everyday community functions are sharply and concurrently interrupted.
- News coverage is more likely to be provided by national organizations over a longer period of time.
- National government and very top officials become directly involved

Category 1 Hurricane: The lowest of five levels of relative hurricane intensity on the Saffir/Simpson hurricane scale. A Category 1 hurricane is defined by winds of 74 to 95 MPH, or a storm surge of 4 to 5 feet above normal. This category normally does not cause real damage to permanent structures, although damage to unanchored mobile homes, shrubbery, and trees can be expected. Also some coastal road flooding and minor pier damage. (Notification Manual)

Category 2 Hurricane: The second of five levels of relative hurricane intensity on the Saffir/Simpson hurricane scale. A Category 2 hurricane is defined by winds of 96 to 110 MPH, or a storm surge of 6 to 8 feet above normal. This category normally causes some roofing material, door, and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers can be expected. Coastal and low lying escape routes can be expected to flood 2 to 4 hours before arrival of storm center. Small craft in unprotected anchorages will bread mooring. (Notification Manual)

Category 3 Hurricane: The third of five levels of relative hurricane intensity on the Saffir/Simpson hurricane scale. A Category 3 hurricane is defined by winds of 111 to 130 MPH, or a storm surge of 9 to 12 feet above normal. This category normally does some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast can be expected to destroy smaller structures, with larger structures damaged by floating debris. Terrain continuously lower than 5 feet above sea level may be flooded inland as far as 6 miles. (Notification Manual)

Category 4 Hurricane: The fourth of five levels of relative hurricane intensity on the Saffir/Simpson hurricane scale. A Category 4 hurricane is defined by winds of 131 to 155 MPH, or a storm surge of 13 to 18 feet above normal. This category normally causes more extensive curtain wall failures, with some complete roof structure failure on small residences. Major erosion will occur at beach areas. Major damage to lower floors of structures near the shore can be expected. Terrain continuously lower than 10 feet above sea level may be flooded, requiring massive evacuation of residential areas inland as far as 6 miles. (Notification Manual)

Category 5 Hurricane: The severest of five levels of relative hurricane intensity on the Saffir/Simpson hurricane scale. A Category 5 hurricane is defined by winds greater than 155 MPH, or a storm surge greater than 18 feet above normal. This category normally causes complete roof failure on many residential and industrial buildings; some are blown over or away. Major damage to lower floors of all structures located less than 15 feet above sea level and within 500 yards of the shoreline can be expected.

Massive evacuation of residential areas on low ground within 5 to 10 miles of the shoreline may be required. (Notification Manual)

Climate Change: Any significant change in the measures of climate (e.g., temperature, precipitation, wind patterns, etc.) lasting for an extended period of time

Comprehensive Emergency Management Plan (CEMP): Operations plan required under Chapter 252.38(1), Florida Statutes, that defines the organizational structure, chain of command, and operational procedure for the preparation, response and recovery, and mitigation efforts associated with an emergency; includes a basic plan as well as a recovery annex and mitigation annex. It contains policies, authorities, concept of operations, legal constraints, responsibilities, and emergency functions to be performed. Agency and departmental response plans, responder Standard Operating Procedures (SOPs), and specific incident action plans are developed from this strategic document.

Comprehensive Plan: An official document in ordinance form adopted by the local government setting forth its goals, objectives, and policies regarding the long-term development of the area within its jurisdiction; the Coastal Management Element of Palm Beach County's plan contains emergency management guidance and references the PDRP.

Consequence: The outcome of an event or situation expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. (Standards 1995)

Continuity of Government (COG): All measures that may be taken to ensure the continuity of essential functions of governments in the event of emergency conditions, including line-of-succession for key decision-makers.

Continuity of Operations Plan (COOP): An internal planning effort within individual component entities, agencies, or government organizations to ensure the capability exists to continue essential "mission-critical functions" across a wide range of potential emergencies.

Crisis: An event and/or a situation which endangers the established system, the health, life, and property of its members and urgently requires intervention.

Crisis Management: The process by which an organization or community deals with a major event that threatens to harm or has harmed the organization, community, its stakeholders, and/or the general public.

Damage Assessment: The process used to appraise or determine the number of injuries and deaths, damage to public and private property, and the status of key facilities and services such as hospitals and other health care facilities, fire and police stations, communications networks, water and sanitation systems, utilities, and transportation networks resulting from a human-generated or natural disaster.

Declaration: The formal action by the President to make a State eligible for major disaster or emergency assistance under the Robert T. Stafford Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Disaster: Any natural, technological, or civil emergency that causes damage of sufficient severity and magnitude to result in a declaration of a state of emergency by a county, the Governor, or the President of the United States. Disasters shall be identified by the severity of resulting damage, as follows:

- Catastrophic Disaster – A disaster that will require massive state and federal assistance, including immediate military involvement;
- Major Disaster – A disaster that will likely exceed local capabilities and require a broad range of state and federal assistance; and
- Minor Disaster – A disaster that is likely to be within the response capabilities of local government and to result in only a minimal need for state or federal assistance.

Disaster Field Office: The office established in or near the designated area of a Presidentially declared major disaster to support Federal and State response and recovery operations. The DFO houses the FCO and ERT, and where possible, the SCO and support staff.

Disaster Management: The body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at all levels. (UN 1992)

Disaster Response: A sum of decisions and actions taken during and after disaster, including immediate relief, rehabilitation, and reconstruction.

Economic Redevelopment: The post disaster process of organizing local, state and federal agencies and programs to work in concert with the private, public and non-profit sectors to develop strategies, plans and actions for redeveloping/rebuilding the damaged local economy. Community recovery is largely an economic proposition, but there is no organized government assistance program for community economic redevelopment.

Emergency: An unexpected situation or event, which places life and/or property in danger and requires an immediate response to protect life and property. Examples of an emergency may include fires; explosions; chemical, biological, environmental, and radiation incidents; bomb threats; civil disturbances; medical emergencies; natural disasters; structural failures; and accidental or human-generated disasters. Any aircraft crash, hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire,

explosion, or other catastrophe which requires emergency assistance to save lives and protect public health and safety or to avert or lessen the threat of a major disaster.

Emergency Management: Organized analysis, planning, decision-making, and assignment of available resources to mitigate (lessen the effect of or prevent) prepare for, respond to, and recover from the effects of all hazards. The goal of emergency management is to save lives, prevent injuries, and protect property and the environment if an emergency occurs. (FEMA 1995).

Emergency Response Period: The Emergency Response period includes activities that address the immediate and short-term effects of an emergency or disaster. Response activities are contained within the ESFs of the CEMP and include immediate actions to save lives, protect property, meet basic human needs, and begin to restore water, sewer, and other essential services. During the Response period, Plan activation is the only PDRP implementation activity. (FDCA/FDEM, 2010)

Milestones that typically mark the end of the Response period include the following:

- Major streets are cleared of debris to allow for restricted travel;
- Re-entry or at least temporary re-entry of the public to assess damage to their personal property is allowed; and
- Curfews are reduced or lifted (if a minor disaster).

Federal Coordinating Officer (FCO): Federal Coordinating Officers (FCOs) are appointed to manage Federal resources during a disaster. They have a prominent role in helping FEMA accomplish its core missions of saving lives, preventing suffering, protecting property, and conducting recovery operations. Their primary mission is to coordinate the timely delivery of Federal assistance to State and local governments, individual victims and the private sector.

Federal Disaster Recovery Coordinator (FDRC): Works as a deputy to the Federal Coordinating Officer (FCO) for all matters concerning disaster recovery. The Federal Disaster Recovery Coordinator is responsible for facilitating disaster recovery coordination and collaboration between the Federal, Tribal, State and local governments, the private sector and voluntary, faith-based and community organizations. The Federal Disaster Recovery Coordinator partners with and supports the Local Disaster Recovery Manager (LDRM) and the State and/or Tribal Disaster Recovery Coordinator (SDRC/TDRC) to facilitate disaster recovery in the impacted State or Tribal area.

Federal Response Plan (FRP): 1) The plan designed to address the consequences of any disaster or emergency situation in which there is a need for Federal assistance under the authorities of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 et seq. 2) The FRP is the Federal government's plan of action for assisting affected States and local jurisdictions in the event of a major disaster or emergency. As the implementing document for the Stafford Act, the FRP organizes

the Federal response by grouping potential response requirements into 12 functional categories, called Emergency Support Functions.

FEMA Emergency Support Function #14 (Long Term Community Recovery): FEMA Emergency Support Function (ESF) #14 Community Recovery coordinates the resources of federal departments and agencies to support the long-term recovery of States and communities, and to reduce or eliminate risk from future incidents. Led by the Federal Emergency Management Agency ESF #14 is supported by four primary agencies including the Departments of Agriculture, Commerce, Homeland Security, Housing and Urban Development and Treasury, as well as the Small Business Administration. A number of other agencies serve in a support role.

Flood Insurance Rate Map (FIRM): The insurance and floodplain management map produced by FEMA that identifies, based on detailed or approximate analyses, the areas subject to flooding during a 1-percent-annual-chance flood event in a community. Flood insurance risk zones, which are used to compute actuarial flood insurance rates, also are shown. In areas studied by detailed analyses, the FIRM shows BFEs to reflect the elevations of the 1-percent-annual-chance flood. For many communities, when detailed analyses are performed, the FIRM also may show areas inundated by 0.2-percent-annual-chance flood and regulatory floodway areas.

Hazard: A condition with the potential for harm to the community or environment. Many use the terms "hazard" and "disaster agent" interchangeably. Hence, they will refer to "the hurricane hazard" or even more broadly to "natural hazards" which includes hurricanes, tornadoes, earthquakes and other natural phenomena that have the potential for harm. The hazard is the potential; the disaster is the actual event. (Drabek 1997)

Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss (FEMA 1997, xxi).

Hazard: A situation or condition that presents the potential for causing damage to life, property, and/or the environment an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. May be biological, chemical, or physical agents capable of causing adverse health effects or property damage given a particular environment or location.

Hazard Analysis: The identification and evaluation of all hazards that potentially threaten a jurisdiction to determine the degree of threat that is posed by each. (Michigan DEM, 1998)

Hazard Assessment: The process of estimating, for defined areas, the probabilities of the occurrence of potentially-damaging phenomenon of given magnitudes within a specified period of time. Hazard assessment involves analysis of formal and informal

historical records, and skilled interpretation of existing topographical graphical, geological geomorphological, hydrological, and land-use maps. (Simeon Institute 1998)

Hazard Identification: The process of defining and describing a hazard, including its physical characteristics, magnitude and severity, probability and frequency, causative factors, and locations/areas affected. (FEMA 1997)

Hazard Mitigation: Any action taken to reduce or eliminate the long-term risk to human life and property from hazards. The term is sometimes used in a stricter sense to mean cost-effective measures to reduce the potential for damage to a facility or facilities from a disaster event.

Hazard Probability: The estimated likelihood that a hazard will occur in a particular area.

Hazard Risk: The probability of experiencing disaster damage.

Hazard, Natural: Naturally caused events such as hurricanes, tornadoes, earthquakes, floods, volcanoes and forest fires.

Hazard, Technological: Typically man-related hazards such as nuclear power plant accidents, industrial plant explosions, aircraft crashes, dam breaks, mine cave-ins, pipeline explosions and hazardous material accidents. (Unknown source)

Hazard, Environmental: The threat potential posed to man or nature by events originating in, or transmitted by, the natural or built environment. (Kates 1978)

Hazard Probability: The estimated likelihood that a hazard will occur in a particular area.

Hazard Risk: The probability of experiencing disaster damage.

Hazard Vulnerability: The susceptibility of life, property, or the environment to damage if a hazard occurs.

Hazard Vulnerability Analysis (HVA): A structured approach to assist in evaluating potential adverse events or conditions that could disrupt an organization's operation. Identify, evaluate, and prioritize events that could significantly affect the need for the facility's services or its ability to provide those services. Each potential event is evaluated in each of three categories: probability (of occurrence), risk (severity/impact), and preparedness and assigned a numerical score that rank orders events needing organization focus and resources for emergency planning.

Hazardous Material (HAZMAT): Any material which is explosive, flammable, poisonous, corrosive, reactive, or radioactive (or any combination), and requires special care in handling because of the hazards posed to public health, safety, and/or the environment. (Firescope 1994)

Human-Made Disasters: Disasters or emergency situations where the principal, direct cause(s) are identifiable human actions, deliberate or otherwise. Apart from "technological" and "ecological" disasters, this mainly involves situations in which civilian populations suffer casualties, losses of property, basic services and means of livelihood as a result of war or civil strife, for example: Human-made disasters/emergencies can be of the rapid or slow onset types, and in the case of internal conflict, can lead to "complex emergencies" as well. Human-made disaster acknowledges that all disasters are caused by humans because they have chosen, for whatever reason, to be where natural phenomena occurs that result in adverse impacts of people. This mainly involves situations in which civilian populations suffer casualties, losses of property, basic services and means of livelihood as a result of war, civil strife, or other conflict. (Simeon Institute)

Incident: Under the ICS concept, an incident is an occurrence, either human-caused or by natural phenomena, that requires action by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources. (FEMA Disaster Dictionary 2001, 62-63, citing National Wildfire Coordinating Group, Incident Command System, National Training Curriculum, ICS Glossary (PMS 202, NFES #2432), October 1994)

Incident Command System (ICS): A standardized on-scene emergency management concept specifically designed to allow it's users to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. (NWCG 1994)

Individual Assistance: Supplementary Federal assistance provided pursuant to a Presidential Declaration of emergency or major disaster under the Stafford Act to individuals and families adversely affected. Such assistance may be provided directly by the Federal Government or through State or local governments or disaster relief organizations.

Inland Flooding: Occurs when moderate precipitation accumulates over several days, intense precipitation falls over a short period, or a water body overflows.

Intensity: The damage-generating attributes of a hazard. For example, water depth and velocity are commonly used measures of the intensity of a flood. For hurricanes, intensity typically is characterized with the Saffir/Simpson scale, which is based on wind velocity and storm surge depths. (Deyle, French, Olshansky, and Paterson 1998)

Inundation: Water covering normally dry land.

Long-Term Redevelopment: The protracted phase of recovery that follows intermediate and short-term recovery focusing on redevelopment and revitalization of the overall community. It involves the total holistic process of rebuilding damaged and destroyed social, economic, natural, and built environments in the community to levels acceptable to stakeholders and moving the community toward a state of self-sufficiency, sustainability, economic viability and disaster resiliency. Long-term recovery activities

may continue for years or decades depending on the severity and extent of the disaster damages and the availability of resources.

There are three major components to the long-term redevelopment period:

1. *Reconstruction* – The long-term process of rebuilding a community's destroyed or damaged housing stock, commercial and industrial buildings, public facilities, and infrastructure to the same pre-disaster levels and standards.
2. *Holistic Recovery* – The recovery of the economy and quality of life factors within the community, including employment opportunities, social networks, cultural events, environmental quality, and educational and recreational opportunities.
3. *Community Enhancement* – The process of going beyond restoring all aspects of the community to normal functions by creating conditions improved over those that existed before the disaster. Community enhancement is characterized by activities such as implementing hazard mitigation projects during rebuilding, strengthening building codes, changing land use and zoning designations, improving transportation corridors, building more affordable housing, and developing new economic opportunities.

Milestones that may signal a successful completion of the long-term redevelopment period include the following:

- Replacement of housing stock adequate for the post-disaster population such that
Interim housing can be removed;
- Economic indicators show unemployment has stabilized at a rate near pre-disaster levels or comparative to other similar locations;
- 70% or more of businesses have reopened and remained in business for at least 3 months or have been replaced; and
- The percent of population dependent upon disaster assistance and social assistance programs has decreased to near pre-disaster levels.

Local Disaster Recovery Managers (LDRMs): In accordance with the National Disaster Recovery Framework, locally designated LDRMs are charged with leading disaster recovery activities for their respective jurisdictions, represent and speak on behalf of their chief executives, and serve as the primary point of contact with the State Disaster Recovery Manager and Federal Disaster Recovery Coordinator.

Local Mitigation Strategy (LMS): Multi-jurisdictional hazard mitigation plan required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act as a condition of federal grant assistance. The LMS is administered by a multi-jurisdictional,

multi-disciplinary Steering Committee and a number of standing and ad hoc subcommittees.

Long Term Community Recovery (LTCR): LTCR is the process of establishing a community-based, post-disaster vision and identifying projects and project funding strategies best suited to achieve that vision, and employing a mechanism to implement those projects. Each community's LTCR program is shaped by the community itself, the damage sustained, the issues identified, and the community's post disaster vision for the future.

Long-Term Redevelopment: The process of going beyond restoring all aspects of the community to normal functions by creating conditions improved over those that existed before the disaster. Long-term redevelopment is characterized by activities such as implementing hazard mitigation projects during rebuilding, strengthening building codes, changing land use and zoning designations, improving transportation corridors, building more affordable housing, and developing new economic opportunities. (Hillsborough PDRP)

Major Disaster: Any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought) or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which, in the determination of the President, causes damage of sufficient severity and magnitude to warrant major disaster assistance under the Stafford Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby. (Robert T. Stafford Act 102; 44 CFR 206.2 and 206.36)

Mitigation: A sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects. Mitigation distinguishes 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 event. (FEMA 1997, Multi Hazard . . . , xxii).

National Disaster Recovery Framework (NDRF): A federal guide released in September 2011 intended to enable inclusive, collaborative, comprehensive effective recovery support to disaster-impacted States, Tribes, Territorial and local jurisdictions. It provides a flexible structure that enables disaster recovery managers to operate in a unified and collaborative manner. It also focuses on how best to restore, redevelop and revitalize the health, social, economic, natural and environmental fabric of the community and build a more resilient Nation. The NDRF is based on the principle that the "Whole Community," including the private sector, non-profit organizations, faith-based organizations, individual citizens, as well as local, state, tribal and federal government agencies have a role to play and have resources that potentially can be leveraged in the recovery process.

Post Disaster Redevelopment Plan (PDRP): A plan which identifies policies, operational strategies, and roles and responsibilities for implementation that will guide

decisions and actions that affect long-term recovery and redevelopment of the community after a disaster. It emphasizes seizing opportunities for hazard mitigation and community improvement consistent with the goals of the local comprehensive plan and with full participation of the citizens. Recovery topics addressed include sustainable land use, housing repair and reconstruction, business resumption and economic redevelopment, infrastructure restoration and mitigation, long-term health and social services support, environmental restoration, financial considerations, and short-term recovery actions that affect long-term redevelopment as well as other long-term recovery issues identified by the community. (Florida Department of Community Affairs/Florida Division of Emergency Management, 2010)

PDRP Executive Committee: A select group of community leaders representing public and private sector organizations and disciplines critical to the development and implementation of the PDRP. The committee serves as a steering committee, providing direction, policy guidance in support of long-term post disaster recovery, reconstruction and economic redevelopment.

PDRP Stakeholder Group: The sum total of PDRP working group members who may meet periodically to share information, discuss recovery and redevelopment progress and issues, and strategize resolutions of critical issues.

Preparedness: Those activities, programs, and systems that exist prior to an emergency and are used to support and enhance response to and recovery from an emergency or disaster. Preparedness takes the form of plans, procedures and actions designed to save lives and to minimize damage when an emergency occurs. Planning, training, and disaster drills are the essential elements of preparedness. These activities ensure that when a disaster strikes, emergency managers will be able to provide the best response possible.

Prevention: Encompasses activities designed to provide permanent protection from disasters. It includes engineering and other physical protective measures, and also legislative measures controlling land use and urban planning. See also "preparedness". (U.N., 1992)

Probability Analysis: The derivation of both the likelihood of incidents occurring and the likelihood of particular outcomes (or effects) should those events occur. (NSW, 1989)

Protection: Sea level adaptation policies that support coastal protection through physical means rather than retreat or accommodation. Such strategies may include a range of actions from the construction of barriers to stabilizing vegetation on berms in shallow waters offshore. Other alternatives may include creating breaks and adjusting the height of berms to allow tidal flow, and in spaces between mainland and offshore plantings, establish salt marsh grasses or other appropriate species. The depositing of sediment at a rate required to allow plantings to adapt to the rate of sea level rise can also provide elements of shoreline protection.

Public Assistance (PA): Supplementary federal assistance provided pursuant to a Presidential Declaration of emergency or major disaster under the Stafford Act to State and local governments or certain private, not-for-profit organizations other than assistance for the direct benefit of individuals and families. (FEMA/EMI, 1996))

Recovery: Those long-term activities and programs beyond the initial crisis period of an emergency or disaster and designed to return all systems to normal status or to reconstitute these systems to a new condition that is less vulnerable. (FEMA 1992

Recovery Support Functions: The Recovery Support Functions (RSFs) comprise the *National Disaster Recovery Framework's (NDRF's)* coordinating structure for key functional areas of assistance. Their purpose is to support local governments by facilitating problem solving, improving access to resources and by fostering coordination among State and Federal agencies, nongovernmental partners and stakeholders.

Reconstruction, Long-Term: The long-term process of rebuilding a community's destroyed or damaged housing stock, commercial and industrial buildings, public facilities, and infrastructure to similar levels and standards as existed before the disaster.

Redevelopment Task Force: An ad hoc group of working group chairs and members who convene, as necessary, to ensure inter-working group cooperation, coordination and information sharing on long-term recovery matters.

Relative Sea Level Rise: The increase in ocean water levels at a specific location, taking into account both global sea level rise and local factors such as subsidence and uplift.

Resilience: The capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in functioning and structure. This is determined by the degree to which the social system is capable of organizing itself, and the ability to increase its capacity for learning and adaptation, including the capacity to recover from a disaster. (U.N. ISDR. 2002)

Resilience, Community: The capability of a community to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change. (CARRI)

Response: Activities to address the immediate and short-term effects of an emergency or disaster. Response includes immediate actions to save lives, protect property, meet basic human needs, stabilize the situation, and prevent further losses. Based on the requirements of the situation, response assistance will be provided to an affected State under the Federal Response Plan using a partial activation of selected Emergency Support Functions (ESF's) or the full activation of all 12 ESF's to meet the needs of the situation. (FEMA FRP, Appendix B)

Retreat: In highly vulnerable areas, which are very likely to be inundated, the jurisdiction may consider planned retreat strategies and employ the use of “rolling easements.” This strategy requires human activities to yield the right of way to naturally migrating shores. This strategy is a narrowly tailored method to ensure that natural shorelines survive rising sea levels. The simplest way to implement rolling easements throughout a state would be to prohibit the construction of bulkheads or any other structures that interfere with naturally migrating shores. Another approach would be for the government to purchase the right to develop property or to take possession of privately owned land whenever the sea rises above a threshold level.

Risk: A measure of the probability of damage to life, property, and/or the environment, which could occur if a hazard manifests itself, including the anticipated severity of consequences to people.

Risk Analysis: Risk analysis is the most sophisticated level of hazard assessment. It involves making quantitative estimates of the damage, injuries, and costs likely to be experienced within a specified geographic area over a specific period of time. Risk, therefore, has two measurable components: (1) the magnitude of the harm that may result (defined through vulnerability assessment); and (2) the likelihood or probability of the harm occurring in any particular location within any specified period of time (risk = magnitude x probability). A comprehensive risk analysis includes a full probability assessment of various levels of the hazard as well as probability assessments of impacts on structures and populations. (Deyle, French, Olshansky, and Paterson, 1998)

Risk Assessment: The process of identifying the likelihood and consequences of an event to provide the basis for informed decisions on a course of action. (FEMA, 1992)

Risk Assessment: Process or method for evaluating risk associated with a specific hazard and defined in terms of probability and frequency of occurrence, magnitude and severity, exposure, and consequences" (FEMA 1997, Multi Hazard. . . , xxi).

Risk Management: The systematic management of administrative decisions, organizations, operational skills and responsibilities to apply policies, strategies and practices for disaster risk reduction. (U.N. ISDR, 2002)

Salt Water Intrusion: Displacement of fresh water by the advance of salt water due to its greater density, usually in coastal or estuarine areas.

Short-Term Recovery: The short-term recovery period encompasses activities such as damage assessments, public information, the transition from shelters to interim housing, utility restoration, and debris clearance. Short-term recovery does not include the redevelopment of the built environment, economic sector, or normal social networks. Emergency repairs and minor reconstruction, however, will occur during this phase as well as decisions that may affect long-term redevelopment. (FDCA, FDEM, PDRP Guide, 2010)

Milestones that may mark the end of the short-term recovery period include the following:

- Building moratoria are lifted, at least for most areas of the county;
- Power and water are restored to all but the destroyed structures;
- Schools are reopened or temporarily relocated; and
- Most of the road network and traffic signalization is operational.

Stafford Act: 1) The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended. 2) The Stafford Act provides an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from disaster. The President, in response to a State Governor's request, may declare and "emergency" or "major disaster" in order to provide Federal assistance under the Act. The President, in Executive Order 12148, delegated all functions, except those in Sections 301, 401, and 409, to the Director, of FEMA. The Act provides for the appointment of a Federal Coordinating Officer who will operate in the designated area with a State Coordinating Officer for the purpose of coordinating state and local disaster assistance efforts with those of the Federal Government. (44 CFR 206.2)

State Disaster Recovery Manager (SDRM): In accordance with the National Disaster Recovery Framework serves as the conduit to local governments for key Federal recovery assistance programs, establishes and/or leads a statewide structure for managing recovery, provides support for local recovery-dedicated initiatives, ensures local governments understand their responsibilities and options, and facilitates the development of a unified and accessible communication strategy.

Sustainable Communities: Where people and property are kept out of the way of natural hazards, where the inherently mitigating qualities of natural environmental systems are maintained, and where development is designed to be resilient in the face of natural forces. (Godschalk, Kaiser, and Berke 1998, 86)

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In the context of emergency management, this meaning remains and it is linked to creating places that are less vulnerable to natural and technological hazards and that are resilient to those events. Sustainable hazard management has five components: environmental quality; quality of life; disaster resilience; economic vitality; and inter- and intra-generational equity. Reducing the risk from hazards, reducing losses from disasters and working toward sustainable communities go hand-in-hand. (Britton, 1998)

Vulnerability: The susceptibility to injury or damage from hazards. (Godschalk, 1991)

Vulnerability Analysis: A determination of possible hazards that may cause harm. Should be a systematic approach used to analyze the effectiveness of the overall (current or proposed) emergency management, security, and safety systems at a particular facility



Vulnerability Assessment: The process of characterizing exposed populations and property and the extent of injury and damage that may result from a hazard event of a given intensity in a given area. (Deyle, French, Olshansky and Paterson, 1998).

Working Groups: Multi-disciplinary teams of public and private sector subject experts charged with implementing and supporting decisions and actions in key topic areas, including: public and private infrastructure and facilities, housing, land use, health and social services, economic redevelopment, environmental restoration, public outreach, and jurisdictional governance/financial administration. Successful implementation of PDRP actions in the post disaster environment depends heavily on these work groups.

ACRONYMS

ACOE	Army Corps of Engineers
ADA	Americans with Disabilities Act
AIA	American Institute of Architects
AMI	Area Median Income
ARES	Amateur Radio Emergency Service
BCRM	Business Continuity and Risk Management Program
BAIHP	Building America Industrialized Housing Partnership
BOCC	Board of County Commissioners
CARE	Conservation and Aquifer Recharge Element
CBA	Certified Business Analyst
CCMP	Comprehensive Conservation and Management
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CERT	Community Emergency Response Team
CHHA	Coastal High Hazard Area
CIP	Capital Improvement Program
CIT	Community Investment Tax
CME	Coastal Management and Port Element
COAD	Community Organizations Active in Disasters
COG	Continuity of Government
COOP	Continuity of Operation Plan
CPIC	Citizen's Property Insurance Corporation
CRS	Community Rating System
DRC	Disaster Recovery Center
DRC	Disaster Recovery Coalition
EAR	Evaluation and Appraisal Report
EAS	Emergency Alert System
ECC	Emergency Communication Center
EHEAP	Emergency Home Energy Assistance for the Elderly
EIDL	Economic Injury Disaster Loans
ELAPP	Environmental Lands Acquisition and Protection Program
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPC	Environmental Protection Commission

EPG	Executive Policy Group
ERM	Environmental Resources Management
ESF	Emergency Support Function
FAU	Florida Atlantic University
FCO	Federal Coordinating Officer
FDCA	Florida Department of Community Affairs
FDEO	Florida Department of Economic Opportunity
FDEM	Florida Division of Emergency Management
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FDRC	Federal Disaster Recovery Coordinator
FEMA	Federal Emergency Management Agency
FHFC	Florida Housing Finance Corporation
FHRP	Farmworker Housing Recovery Program
FIND	Florida Interfaith Network for Disasters
FIU	Florida International University
FMA	Flood Mitigation Assistance
FMAP	Florida Market Assistance Program
FMSAS	Florida Marine Spill Analysis System
FPL	Florida Power & Light
FSBDCN	Florida Small Business Development Center Network
FWC	Florida Fish and Wildlife Conservation Commission
GAO	Government Accountability Office
GDP	Gross Domestic Product
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program
HUD	Housing and Urban Development
IHP	Individuals and Households Program
JIC	Joint Information Center
LDC	Land Development Code
LDRM	Local Disaster Recovery Manager
LEPC	Local Emergency Planning Committee
LIHEAP	Low Income Home Energy Assistance Program
LMS	Local Mitigation Strategy
LRTP	Long-range Transportation Plan
LTCR	Long Term Community Recovery
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
NDRF	National Disaster Recovery Framework
NMF	National Mitigation Framework
NFIP	National Flood Insurance Program
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRF	National Response Framework
OTTED	Office of Tourism, Trade, and Economic Development

PA	Public Assistance
PBIA	Palm Beach International Airport
PBS	Public Broadcasting Service
PCP	Primary Care Physician
PDM	Pre-Disaster Mitigation Grant Program
PDRP	Post-Disaster Redevelopment Plan
PIO	Public Information Officer
POC	Point of Contact
POD	Point of Distribution
PPD-8	Presidential Policy Directive 8 (National Security)
PRA	Priority Redevelopment Area
RDSTF	Regional Domestic Security Task Force
REACT	Reemployment and Emergency Assistance Coordination Team
RFC	Repetitive Flood Claims
ROC	Recovery Operations Center
RFL	Repetitive Flood Loss
RRLP	Rental Recovery Loan Program
RSF	Recovery Support Function
SBA	Small Business Administration
OSBA	Office of Small Business Assistance
SBDC	Small Business Development Center
SDRM	State Disaster Recovery Manager
SEOC	State Emergency Operations Center
SERC	State Emergency Response Commission for Hazardous Materials
SFWMD	South Florida Water Management District
SHADP	Special Assistance Development Program
SHIP	State Housing Initiatives Program
SLR	Sea Level Rise
SRL	Severe Repetitive Loss
TAC	Technical Advisory Committee
TBRPC	Tampa Bay Regional Planning Council
TCRPC	Treasure Coast regional Planning Council
TDR	Transfer of Development Rights
TIP	Transportation Improvement Program
UASI	Urban Area Security Initiative
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VDC	Volunteers and Donations Center
VRC	Volunteer Reception Center



Volume 2 Appendix 1

**Sea Level Rise Vulnerability &
Redevelopment Assessments &
Strategies**

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PALM BEACH COUNTY

JULY 29, 2012

Overview

This vulnerability assessment examines the influence of sea level rise on Palm Beach County's vulnerability to hurricane storm surge hazards in order to address sea level rise adaptation during post-disaster redevelopment efforts. This document is a preliminary analysis of how proposed sea level rise scenarios may alter the impacts of future storms. This case study then examines a menu of strategic recommendations for local decision makers to holistically address community resilience in the aftermath of a disaster.

Post-Disaster Sustainability: While the scientific community continues to evaluate the myriad of factors affecting the rise of the ocean levels, this assessment provides preliminary adaptation strategies to promote discussion among coastal communities in the aftermath of a large scale disaster. The specific timing horizon for sea level rise remains uncertain; yet, any rise in the level of the ocean could eventually affect the level of threat from hazards Palm Beach County already experiences, such as hurricane storm surge, coastal erosion, land subsidence, and saltwater intrusion of the aquifer (refer to Palm Beach County's Local Mitigation Strategy (2009) for hazard description and analysis). Storm surge augmented by future sea level rise could also produce a cascade of consequences affecting things such as land use, infrastructure, facilities, waterway navigation, local economy, public health, public safety, drinking water supplies, and ecosystems. These consequences may require planners to consider adaptive response options before a disaster.

Adaptation Strategies: After a catastrophic disaster the local leadership may have a unique opportunity to create a more disaster resilient and sustainable community, which further enhances the community vision and is addressed in the Post-Disaster Redevelopment Plan. The purpose of this assessment is to model the potential increases of hurricane storm surge inundation in a hypothetical context that the Atlantic Ocean level increases three feet from its current level. This hypothetical impact of sea level rise may not be felt for decades to come, thus giving local planners, decision makers, elected officials, and communities, ample time to gradually implement the adaptation strategies, which they deem appropriate for their individual communities. The adaptation strategies, which communities may implement over the coming decades, will impact the prioritization of post-disaster redevelopment strategies. For planning purposes, these adaptive response options have been categorized into three general planning strategy areas, which are protection strategies, retreat strategies, and accommodation strategies. This assessment will discuss a range of options within each of these categories for consideration by local decision makers in the aftermath of a disaster.

Planning versus Policy Change: These recommendations are intended for post-disaster planning, education, and awareness purposes only and should not be construed as post-disaster policy guidance needed for site-specific analysis, for post-disaster permitting decisions. Palm Beach County may consider individual adaptation options or reject these recommended adaptation options after a disaster because they

are not a priority or appropriate within the local context. For proposed post-disaster adaptation strategies which are deemed appropriate and viable, they could represent fundamental changes in policy positions post-disaster. These policy shifts would require review and approval by the executive leadership upon which they may be accepted or rejected. The recommendations which are included in this assessment are designed as “model strategies” only. All strategies must be further evaluated for post-disaster application as additional data and information becomes available and specific policy recommendations from the Southeast Florida Regional Climate Change Compact are released. Any and all post-disaster sea level rise adaptation policies which are considered appropriate for Palm Beach County must be reviewed and approved by the governing body.

Palm Beach County's Vulnerability to Sea Level Rise

Palm Beach County completed an assessment of vulnerability due to sea level rise in a report titled, *"Overview Analysis of the Vulnerability of Southeast Florida to Sea Level Rise, South Florida Regional Climate Change Compact Inundation, Mapping and Vulnerability Assessment Work Group, April 2011."* In this report, the County conducted an inundation analysis that identified land at elevations below sea level and highlighted areas located near Palm Beach County's coastline and tidal waterways. The geographical representation of flooding shown on the maps in this document, are based on a bathtub analysis for the three sea level scenarios of one, two and three foot. The flooding areas shown do not reflect additional flooding impacts as a result of hurricanes or the additional hydrologic losses through canal structures as a result of the rise in the sea level. The justification of those impacts will require a much more detailed study. (p. 2).

The report concluded that limited physical infrastructure in Palm Beach County is at risk at the one, two and three foot sea level rise scenario. Initially, low volume roads and parking areas may be impacted at one foot and increase to up to forty-one (41) miles of roadways as the sea level continues to rise to three feet. Property with a current taxable value of \$396-557 million may become vulnerable as sea level rises. Facilities such as wastewater treatment plants, emergency evacuation shelters, landfills, airports, ports and power plants will not likely be affected by sea level rise. One school, one landfill site and one hospital may be impacted at the three (3) foot sea level rise scenario. This assessment further noted that access to and from the barrier islands could be vulnerable due to bridges being inaccessible from local roadway inundation, and coastal marinas could experience impacts. The Palm Beach County assessment prioritizes salt water ponds, salt water marshes and mangrove swamps as potentially sensitive impacted habitats. The assessment conducted in this report does not duplicate, validate, contradict or review the findings of this previous body of work conducted by Palm Beach County which has been reviewed and approved by the Palm Beach County Leadership and the South Florida Regional Climate Change Compact.

As detailed above, the analysis in this assessment is for application in post-disaster redevelopment planning only. The purpose of this assessment is to model the potential increases of hurricane storm surge inundation in a hypothetical context that the Atlantic Ocean level increases three feet from its current level. This hypothetical impact of sea level rise may not be felt for decades to come, thus giving local planners, decision makers, elected officials, and communities, ample time to gradually implement the adaptation strategies which they deem appropriate for their individual communities. The adaptation strategies which communities may implement over the coming decades, will impact the opportunity to apply these post-disaster redevelopment strategies.

Hurricane Storm Surge Vulnerability Assessment Methodology

This assessment evaluates the data from the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model provided by the U.S. National Hurricane Center (NHC), National Oceanic and Atmospheric Administration (NOAA) to determine storm surge zones. SLOSH modeling integrates the maximum surge height for hurricanes of Saffir–Simpson Categories 1, 3, and 5. The model outputs are then converted by geographic information system (GIS) tools into raster grids. GIS tools were employed to delineate the effect of sea level rise on hurricane storm surge by enhancing the projected storm surge by an estimated three foot sea level rise projection. GIS was employed to identify damages to critical facilities, groundwater, inland canals, property and infrastructure to future hurricane storm surge inundation. Using these data outputs provides an initial analysis of the impacts of sea level rise to Palm Beach County and allows community leaders and planners to discuss possible implications for adaptive response to create a more disaster resilient and sustainable community. This case study may be used as an addendum to the Post-Disaster Redevelopment Plan to ensure that impacts are incorporated in the redevelopment decisions of the community.

Using maps with inundation overlays and a series of tables and graphs, this hazard vulnerability analysis will examine the following areas and provide post-disaster redevelopment and adaptation recommendations assuming a three (3) foot rise in sea level and Categories 1, 3, and 5 storm surge increases (see Map Series 1 in Appendix 1):

1. Transportation: This can include ports/marinas, airports, roads, bridges, railways and Tri-Rail Stations, and bus routes.
2. Water infrastructure: This can include water supply treatment plants, wastewater treatment plants, water pumping stations, well field protection areas, and water control structures and systems.
3. Land and Environment: This may include Future Land Use composite, Land Use/Cover, Managed Natural Areas, Vulnerable Species, Critical Beach Erosion, and Beach Access.
4. Public facilities and privately owned facilities important to community redevelopment: This can include emergency shelters, fire and police stations, and other government buildings such as hospitals, adult living facilities, hospice, skilled nursing facilities, city halls, libraries, courthouses, and emergency operations centers.

Appendix 2 details a table which provides the data sources which were employed in this vulnerability assessment.

Land Use and Housing Vulnerabilities and Redevelopment Strategies

Inundation Areas

Palm Beach County is comprised of a total of thirty-eight individual and independent municipal jurisdictions. Most of the land area along the coast is within one of these jurisdictions, with its autonomous politically elected leadership, independent comprehensive plans, and locally controlled land use and zoning policies. Each local jurisdiction will evaluate the appropriate adaptation strategies discussed throughout this section.

Generally, storm surge inundation zones are minimally increased in the County when a sea level rise projection of three feet is added to current SLOSH model output. Map 1 B illustrates the projected change in storm surge boundaries assuming a three (3) foot rise in sea level. Initial analysis indicates that impacts in Palm Beach County may not necessarily be widespread, nor focused on the ocean shoreline, but are concentrated along the Intracoastal Waterway, which is largely due to Palm Beach County's coastal geomorphology, which creates a natural coastal barrier to storm surge. The following municipal jurisdictions, however, may primarily experience increased storm surge effects during a major storm surge event:

- Jupiter
- Juno Beach
- North Palm Beach
- Palm Beach
- Lake Worth
- Boynton Beach
- Ocean Ridge
- Briny Breezes
- Gulf Stream
- Delray Beach

Maps 1A and 1B depict the areas of higher and lower storm surge inundation along the Intracoastal Waterway and the Atlantic coastline. Each of the potentially impacted jurisdictions may consider reevaluating need for adaptation actions within the high risk inundation areas. Within the path of the increased storm surge, communities may choose to implement adaptation strategies to enhance community resilience post-disaster.

Land Use Vulnerability: The purpose of the Future Land Use Map (FLUM) is to illustrate a vision of how the communities within it are created, enhanced and maintained. It identifies different components of the community and the relationships between the social, economic, and physical needs of the residents with the land use designations of the jurisdiction. Future land use designations are intended to direct the location, type, intensity and form of various development patterns that correspond with the characteristics of a specific geographic area.

Map 2 in the Appendix and Table 1 below, provide details regarding the impacted land areas by land use category and severity of impact. The land uses most impacted, based on a percentage of total land, are the commercial uses, followed by recreation uses and residential uses. The majority of Palm Beach County's coastal area is largely developed, with a limited amount of vacant land available for future development. In the worst case inundation scenario (Category 5 hurricane storm surge increased by a three foot sea level rise), twenty-one (21) percent of the commercial land uses may be inundated by flood waters. While this case study did not conduct a detailed economic analysis, it is anticipated that sea level rise could eventually significantly impact various sectors of the economy. The second most impacted land use category is recreational uses which could be inundated up to thirteen (13) percent in the worst case. A total of approximately eight (8) percent of residential uses, totaling over 18,000 acres (the largest total land mass by land use category), could potentially be inundated in the worst case scenario. For these residential areas and others the impacted jurisdiction may consider designating Adaptation Action Areas.

Map 2 in the Appendix also illustrates isolated areas below sea level and areas inundated with three (3) feet of sea level rise. Isolated areas are not connected to any open or tidal body of water. The long-term impact of sea level rise on these isolated areas below sea level is not yet known. There is potential that rising groundwater could impact these areas, but further hydrological studies will be required to make any definitive determinations.

Cities in the northern portions of the county that are most inundated include Juno Beach, and the coastal areas of North Palm Beach and Palm Beach. The areas most inundated in Juno Beach and North Palm Beach include the designated natural areas. Further analysis of this area may be necessary to determine if future land uses may be changed over time in order to decrease vulnerability to hurricane storm surge augmented by sea level rise. Land uses in the southern portions of the County include residential and commercial designations. Table 1, below, indicates the amount of acres and percentage of total land that may be impacted. The land use designations most affected in the inundation are commercial and recreation uses.

Adaptation Action Areas: Florida Statutes Chapter 163.3177(6)(g)(10) states that local communities may: "develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. Local governments that adopt an Adaptation Action Area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high tide events, storm surge, flash floods, stormwater runoff, and related impacts of sea level rise. Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge."

The Adaptation Action Areas may detail where the protection, accommodation, and retreat strategies may be employed. The University of Florida Conservation Clinic Recommendation (2010) for Adaptation Action Areas, released in 2010, developed a set of model comprehensive plan goals, objectives and policies to address sea level rise adaptation in Florida. They recommend the development of a spatial overlay to identify adaptation action areas and designate appropriate strategies within each of these areas. Jurisdictions would regulate the type and density of use, construction and design standards, as well as, other restrictions within each designated zone. The University recommends consideration of three overlay adaptation zones or districts:

- Protection Zone
- Accommodation Zone
- Managed Relocation/Retreat Zone

Table 1: Future Land Uses within Inundation Areas

	Countywide (2004-5)		SLR + Category 1		SLR + Category 3		SLR + Category 5	
Land Use	Acres	Rarity Rank	Acres	Total Percent	Acres	Total Percent	Acres	Total Percent
Residential	235,595.46	8	3,885.22	1.6%	10,301.53	4.4%	18,686.56	7.9%
Commercial	23,618.98	5	1,230.88	5.2%	2,780.95	11.8%	5,009.04	21.2%
Industrial	15,887.25	3	22.32	0.1%	58.46	0.4%	282.22	1.8%
Institution	8,012.57	2	9.93	0.1%	53.39	0.7%	497.18	6.2%
Vacant	4,722.40	1	3.57	0.1%	8.15	0.2%	18.64	0.4%
Recreation	30,582.83	7	1,100.28	3.6%	2,070.55	6.8%	4,002.58	13.1%
Agriculture	471,972.95	10	0.00	0.0%	0.00	0.0%	0.19	0.0%
Natural	410,138.25	9	936.82	0.2%	1,440.87	0.4%	1,881.64	0.5%
Utilities	23,598.04	4	33.53	0.1%	138.51	0.6%	425.86	1.8%
Water	25,436.96	6	692.01	2.7%	954.34	3.8%	1,436.72	5.6%
Grand Total	1,250,054.66		7,914.56	0.6%	17,806.75	1.4%	32,240.63	2.6%

Potential Vulnerabilities

An assessment of impacts of sea level rise on future land use designations is necessary since it illustrates the vision of the County / Municipality and how it intends to grow. Generally, the areas in the northern part of the County do not appear that they will suffer as much inundation in comparison with the southern parts of the County, particularly along the Intracoastal Waterway. Many of the areas in Palm Beach County that are impacted by sea level rise are already fully developed or consist of natural lands. Table 1 reveals that over 1,800 acres of natural lands could be impacted. Particularly where rare species reside in sensitive habitats, the loss of these natural lands could have far reaching environmental consequences. For further discussion on environmental impacts, review the environmental section of this document. The rise in sea level could

result in losses of land and structures, impact on utilities and infrastructure, and cause a reduction in value of real estate, among others.

Adaptation Strategies¹

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact.

Adaptation Action Areas

Protection and accommodation strategies are more likely on the Palm Beach County coastline due to the current density of development and limited ability to retreat. Strategies may be adopted based on the variations in risk, densities, and current use of the land. Impacted jurisdictions may consider the development of a spatial overlay to identify Adaptation Action Areas and designate appropriate strategies within each of these areas. Recommended zones may include protection zone, accommodation zone, and managed relocation/retreat zone. The type and density of use, construction and design standards, as well as, other restrictions permitted within each designated zone, may be evaluated by each local community and based on local preferences. A full range of regulatory tools including setbacks, buffer zones, conditional development and exactions, rebuilding restrictions, subdivision and cluster development, building code and design standards, hard and soft armoring permits, and rolling easement or conservation easement statutes may be considered for each zone.

Retreat: In highly vulnerable areas, which are very likely to be inundated, the jurisdiction may consider planned retreat strategies and employ the use of “rolling easements.” This strategy requires human activities to yield the right of way to naturally migrating shores. This strategy is a narrowly tailored method to ensure that natural shorelines survive rising sea levels. The simplest way to implement rolling easements throughout a state would be to prohibit the construction of bulkheads or any other structures that interfere with naturally migrating shores. Another approach would be for the government to purchase the right to develop property or to take possession of privately owned land whenever the sea rises above a threshold level. Alternatively, the deed to the property could specify that the boundary between publicly owned tidelands and the privately owned dry land will migrate inland to the natural high water mark, whether or not human activities artificially prevent the water from intruding.

The private sector could also play a role. For example, a land trust or an environmentally concerned owner selling coastal property could retain a rolling easement when selling the property, or donate the rolling easement to a conservancy. Other options could include the creation of an alongshore buffer/easement for management, and adaptation. This can include property purchase, purchase of development rights, setbacks/deed restrictions, development disincentives, or sale incentives.

¹ These adaptation strategies are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

The use of the Transfer of Development Rights (TDR) tool may also be effective, particularly in the aftermath of a major disaster, to redirect reconstruction and redevelopment efforts away from the highest risk areas by providing incentives to relocate to less vulnerable areas. If the jurisdiction chooses to implement a sea level rise adaptation strategy, which incorporates Adaptation Action Areas, then the use of TDRs may be incorporated within the concept. The TDR strategy would be used to relocate residential and commercial uses within a managed relocation / retreat zone to areas of less risk. Coordination and cooperation among the coastal jurisdictions may be valuable in an effort to comprehensively implement this strategy.

Accommodation: If the county and coastal jurisdictions do not want to retreat and wish to continue to use areas that will be impacted by hurricane storm surge increased by sea level rise, planners may wish to consider construction standards and more appropriate uses. Other accommodation strategies may include converting land use to uses that are water dependent, adaptable, or evolve as sea levels rise. For example, expanding or adding marinas could have a positive impact in generating marine-based tourism. Palm Beach County and the municipal jurisdiction within may benefit by increasing the number and distribution of boat ramps for boaters to launch their vessels. Converting land uses to permit more boat ramps, docking, and other related marine infrastructure would accommodate for sea level rise and have the potential to generate more revenue, both by tourists and local residents who are recreational boaters.

The vulnerability analysis indicates that several of the areas at risk for inundation are currently being used as golf courses. Routine, prolonged and/or permanent inundation by sea water will render these golf courses unusable. Integration of good waterfront design principles and the development of incentives for creative reuse are also accommodation strategies that can be incorporated into future land use planning, as well as revisions to the land development code.

Protection: Adaptation policies that support protection strategies can include the establishment of requirements for stabilizing vegetation on berms in shallow waters offshore. Other alternatives may include creating breaks and adjusting the height of berms to allow tidal flow, and in spaces between mainland and offshore plantings, establish salt marsh grasses or other appropriate species. The depositing of sediment at a rate required to allow plantings to adapt to the rate of sea level rise (rate of SLR minus accretion rate of plantings), can also provide elements of shoreline protection.

Transportation Infrastructure Vulnerabilities and Redevelopment Strategies

Port of Palm Beach and Marinas

Located in the City of Riviera Beach, the Port of Palm Beach (POPB) is rated fourth in the movement of containers out of fourteen deepwater ports in Florida and is rated eighteenth in the continental United States. Unlike most ports in the U.S., the POPB is an export port, with approximately eighty percent of its cargo being exported. In addition to intermodal capacity, the Port is a major node for the shipment of bulk sugar (domestic usages), molasses, cement, utility fuels, water, produce and break bulk items. The Florida East Coast Railway Company (FEC) services the docks and piers through the Port's industrial rail switching operations. The POPB is the only port facility in South Florida operating a rail system with pier-side box, hopper and intermodal cars operating 24 hours a day. Located on the port property are six miles of tracks for intermodal transfers and handling. In 2010, the port moved over 213,000 twenty (20) foot container equivalent units. The port is also host to the Bahamas Celebration cruise ship which brings 275,000 passengers to the port.

A half dozen marinas are scattered throughout the County as indicated on Maps 3A and 3B of the Appendix. These marinas are primarily located along the Intracoastal Waterway and waterways which feed the Intracoastal. No site specific field analysis has been conducted to support this analysis. Additional information will be needed to evaluate potential impacts that these marinas may experience. Docks that do not float, ramps, and marine industry support facilities such as fueling sites, may be impacted in the aftermath of a large scale disaster.

Potential Vulnerabilities

The POPB is a water-dependent critical facility with 156 acres of property requiring protection to remain a viable port of operations. The sea walls surrounding the port are generally high and may be able to accommodate a 3 foot rise in sea level. However, the end of the three dockage slips are lower than the sea walls in order to accommodate drop down ramps from the ships that dock in those slips. See Figure 1 in which these areas are indicated. Although a rise in sea level only will not overtop the ends of these slips, the increase in surge as a result of sea level rise may increase the vulnerability of port infrastructure to sea water overtopping the end of the slip and inundating port property and damaging infrastructure. Marinas throughout the County could experience similar challenges to their facilities.

Adaptation Strategies²

Since the port is a water-dependent operation, inland retreat is not a practical option for the port. Adaptation strategies that incorporate accommodation and protection

² All adaptation strategies and recommendations are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

measures will be the viable solutions. All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact.

Accommodation: Accommodation measures that perhaps include raising ramp height may be an option for port and marina designers who wish to consider these options in long-range design plans. Similarly, private owners who wish to build docks, may consider elevating these structures or evaluating the use of floating docks. Additional site specific analysis will be required to adequately evaluate appropriate adaption strategies.

Protection: Protection measures could include hardening facilities and infrastructure located on the port property, within public and private marinas, and privately owned docks against increased surge inundation. Also, since daily operations require the ends of the slips to be at a lower height than the other sea walls, port designers and engineers may wish to explore options that allow some type of temporary or removable barrier that can be deployed in the event of a storm to prevent surge waters from overtopping these lower areas of the dock slips. Additional site specific analysis will be required to adequately evaluate appropriate adaption strategies.

Figure 1: Port of Palm Beach with Inundation



Bridges

According to the Florida Department of Transportation (FDOT), bridges are generally designed to have a lifespan of approximately eighty (80) years. The FDOT's 2010 Strategic Intermodal System (SIS) Strategic Plan calls for FDOT to evaluate SIS infrastructure at risk from sea level rise and other climate trends. FDOT addresses adaptation within the broader context of asset management. The State's investment policy is to fund its preservation needs first before investing in capacity improvements.

FDOT is working to decrease vulnerability of state bridges and roads that are at particular risk from extreme weather events and the agency is developing a statewide inventory and action plan for high risk bridges. The State has partnered with Florida Atlantic University to make recommendations for sea level forecasting methods and how data sources can be integrated with FDOT information to assess infrastructure vulnerability. The results of this research are expected to be released in the near future.

Implications of Hurricane Storm Surge augmented by Sea Level Rise

Sea level rise may result in slightly deeper waters within the navigable waterways, which could enable larger vessels to navigate the navigable water channels. This effect, however, is minimal compared with the draft of most large vessels. Saltwater advancing upstream can alter the point at which flocculation leads to sedimentation and the creation of shoals. Similarly, the clearance under bridges may likely decrease due to higher water levels. In a few cases where clearances are extremely tight, this effect could limit the ability of boats to pass underneath a bridge, particularly in the case of very small boats slowly passing underneath very small bridges, where the clearance may be less than a foot. Larger vessels and commercial vessels are less likely to be impeded, because most bridges over key shipping lanes are either drawbridges or have very high spans. (A few low bridges have been deliberately located to prevent large ships from passing farther upstream).³

It may be possible that low-lying roadways, access ramps, bridges, and causeways could be flooded more frequently. Bridges and causeways along hurricane evacuation routes may have to be closed sooner for a given storm intensity. As sea level rises, incidents such as the vertical displacement of bridge segments may occur more frequently, as may erosion of bridge abutments from storm waves and storm currents.

In addition to interference with navigation, sea level rise may also increase the exposure of bridges to saltwater spray with resultant increases in spalling of concrete and more rapid corrosion of steel bridge components and rebar in older bridges. Newer bridges, however, are being constructed with concrete formulations that better resist cracking and spalling as structures age, as well as epoxy-coated rebar that resists corrosion. For additional information consult, *Taking the High Road: Integrating Hazard Mitigation into Long-Range Transportation Planning*.

Potential Vulnerabilities

For the purposes of this pilot study, the vulnerability analysis narrowed the focus onto the major bridges within the County that span the Intracoastal Waterway, which is the primary navigable waterway for marine vessels. Map 5 in the Appendix depicts the location of these bridges. Since bridges are designed with an average 80 year lifespan, bridges nearing this lifespan limit may provide an opportunity to consider the need to incorporate adaptation strategies that include resiliency to sea level rise during reconstruction or rehabilitation. There are two (2) bridges within ten (10) years (built prior to 1942) of this lifespan period. However, lifespan may not be the only

³"The Potential Impacts of Climate Change on Transportation." 2002. U.S. Dept. of Transportation. Workshop Summary and Discussion Paper.

consideration in determining priorities for adaptation. Other factors such as bridges with fixed vertical clearances, health index rating and sufficiency rating may also factor into the planning equation. The following Table identifies bridges with fixed vertical clearances under the bridge roadway along with their health index and sufficiency ratings⁴ Furthermore, if a bridge is damaged or destroyed post-disaster, then this may be another opportunity to consider incorporating enhancements that increase resiliency of these important structures.

Table 2: Bridges with Fixed Vertical Clearances					
Bridge Name	Roadway	Water body	Vertical Clearance	Health Index ⁵	Sufficiency Rating ⁶
Haven Ashe Bridge	A1A	Boca Inlet	15.09	81.7	65.7
Lucas Douglas Memorial Bridge	Palmetto Park Road	Intracoastal Waterway	7.51	84.2	81.6
Indiantown Road Bridge	Eastbound SR706	Intracoastal Waterway	15.09	97.4	93.0
Indiantown Road Bridge	Westbound SR706	Intracoastal Waterway	15.09	98.3	92.0
Theodore Pratt Memorial Bridge	Eastbound Spanish River Blvd	Intracoastal Waterway	22.01	89.7	58.0

Bridge Adaptation Strategies

There are two bridges currently slated by FDOT for replacement as part of their current five-year capital improvements projects plan. These bridges are indicated in yellow in Map 5 in the Appendix. One of these bridges is the Southern Boulevard Bridge which is a draw bridge. The other bridge, which has become a contentious issue for local residents, is the Little Lake Worth Bridge located on A1A east of US 1. This bridge received a structural sufficiency rating of 47.1 and was deemed structurally deficient.

⁴ Source: Office of Maintenance, Florida Department of Transportation (January 2010) & U.S. Department of Transportation.

⁵ Health Index is a tool that measures the overall condition of a bridge using 10 to 12 different elements. A lower health index means that more work would be required to improve the bridge to an ideal condition. A health index below 85 generally indicates that some repairs are needed, although it doesn't mean the bridge is unsafe. A low health index may also indicate that it would be more economical to replace the bridge than repair it.

⁶ Sufficiency Rating is a tool that is used to help determine whether a bridge that is structurally deficient or functionally obsolete should be repaired or just replaced. The sufficiency rating considers a number of factors, only about half of which relate to the condition of the bridge itself. The sufficiency ratings for bridges are part of a formula used by the Federal Highway Administration when it allocates federal funds to the states for bridge replacement.

Approximately forty percent (40%) of the understructure has fallen off or is unsound.⁷ The current clearance of this bridge is approximately 8.5 feet. The design improvements include raising the bridge to the minimum required clearance of twelve (12) feet and increasing the span by about thirty (30) feet. Residents in the area are petitioning for a variance to keep the air draft of the bridge from being raised in order to limit more and larger boats from accessing this area, which they feel may worsen erosion and damage sea grasses and manatees. However, it has also been pointed out that the current design is a hindrance to the performance of public safety activities in that law enforcement resources cannot access this area. This could be of particular concern in the post-disaster environment. The contentiousness of this issue highlights the need for continued public education and community consensus building when trying to incorporate adaptation strategies for sea level rise.

Adaptation Strategies⁸

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact

Accommodation: Since planned retreat is not viable, adaptation strategies would be appropriate and may include increasing the height of the bridge, based on the nature of passing vessels, to accommodate vessel traffic. Because sea level rise may also increase sedimentation in the channels, accommodation strategies may also explore bridge designs that reduce sedimentation that may occur as a result of bridge pilings and abutments blocking tidal and current flow.

Protection: Shore banks may be at greater risk for erosion due to increase of wave height and wave action. This can result in degradation of the bridge foundation and supporting infrastructure. Shoreline stabilization and protection measures that are designed for the increased level of water may be included as part of future bridge design for bridges crossing the Intracoastal Waterway, the Loxahatchee River, and the Boynton and Boca Raton Inlets. Sea level rise may also increase the exposure of bridges to saltwater spray with resultant increases in spalling of concrete and more rapid corrosion of steel bridge components and rebar in older bridges. Newer bridges, however, may be constructed with concrete formulations that better resist cracking and spalling as structures age, as well as epoxy-coated rebar that resists corrosion.

Policy and Planning Implications

Bridges in the study area are all owned by the State of Florida. Construction and design are regulated by the Florida Department of Transportation Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways (commonly referred to as the “Greenbook”) and the Project Development and Environment (PD&E) Manual. Since bridge replacement decisions are in part guided by sufficiency rating scores, local jurisdictions may be limited in the actions they take.

⁷“Upgrading the Bridges of the Palm Beaches.” Palm 2 Jupiter Media, LLC. November 18, 2010. http://www.palm2jupiter.com/STORIES%202010/November%202010/p2j_issue7_Bridges_111810.html

⁸ These mitigation strategies are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

However, local jurisdictions will possess the greatest detail of local knowledge, issues, and consequences. This data will be valuable to FDOT as they formulate long-term plans. Coordination and communication with FDOT is important to ensure local concerns about sea level rise are incorporated into FDOT's long-term planning. Local jurisdictions may have an opportunity to strengthen exchange of information by developing policies in the Intergovernmental Element to support this collaboration.

Roads

Roads are typically designed for an average lifespan of twenty (20) years, which means there may be more frequent opportunity to incorporate sea level rise adaptation into road design and construction. State road design standards mandate stormwater drainage for various flood return frequencies depending on the road's functional classification. These standards are generally considered to be adequate to prevent frequent flooding on new roads. Older roadways, however, may not meet these new design standards and future sea level rise may affect drainage. A needs list of drainage projects for roads with high flood frequencies that are not already scheduled for road improvements could be included in the LMS Project List for potential funding after a disaster. Stormwater drainage projects are eligible under the federal Hazard Mitigation Grant Program, and interruptions in road operation add greatly to benefit cost ratios.

Palm Beach County has a number of major roadways that may be subject to the effects of sea level rise primarily as a result of increased surge and its resultant damaging effects. Incremental adaptations in road reconstruction and maintenance over time, will create a changing environment for post-disaster redevelopment priorities for vulnerable roads. The PDRP, therefore, may incorporate a process to rapidly reevaluate the traffic infrastructure components within the Adaptation Action Areas, post-disaster. This assessment will allow the reevaluation of post-disaster opportunities to strengthen community resilience and incorporate adaptation strategies, which are appropriate within the post-disaster context. The roads listed in Table 3 are considered, in varying degrees, important in movement of vulnerable populations to safer areas. Table 3 provides detailed data regarding the miles of roadways that may be impacted. This information may be useful, particularly for roadway maintenance and improvement planning such as estimating materials and costs prior to a disaster and after disaster impact.

Table 3: Major Roads within Inundation Zones

Roadway	Category 5 + SLR	Category 3 + SLR	Category 1 + SLR	TOTAL
10th Avenue	0.19	0.13	0.00	0.33
Connecting Road	0.08			0.08
County Highway 806A	0.54	0.43	0.23	1.33
County Highway 809	2.54	0.01		2.55
Interstate 95	0.16	0.09	0.06	0.33
Lantana Bridge	0.01	0.01	0.01	0.04
Northlake Boulevard	0.01			0.01
Ocean Avenue	0.30	0.30	0.25	1.04
Old Dixie Highway	1.10			1.10
Ramp	0.18	0.06		0.24
Southern Boulevard	0.41	0.41	0.41	1.24
State Highway 704	2.14	1.59	1.16	5.83
State Highway 706	6.40	4.22	0.53	11.36
State Highway 708	1.58	1.53	0.93	4.33
State Highway 786	3.07	0.98	0.43	4.73
State Highway 798	4.28	1.29	0.90	6.89
State Highway 80	0.23	0.17	0.07	0.47
State Highway 802	1.16	1.00	0.78	3.23
State Highway 804	0.14	0.03		0.17
State Highway 806	0.65	0.45	0.34	1.66
State Highway 808	0.09	0.04	0.04	0.21
State Highway 809	0.04	0.04	0.04	0.13
State Highway 810	1.89	1.45	0.13	3.47
State Highway 811	9.39	3.02	1.16	13.75
State Highway 812	0.08	0.02		0.11
State Highway 869	0.54	0.02		0.55
State Highway 882	0.22	0.13	0.01	0.37
State Highway A1A	34.50	27.87	20.96	88.76
U.S. Highway 1	51.00	24.28	1.15	76.46
U.S. Highway 98	0.02			0.02
East Linton Blvd	0.41	0.31	0.16	0.99
East Ocean Avenue	0.90	0.90	0.75	3.01
East Real	1.40	0.88	0.36	2.64
East Woolbright Road	0.09	0.09	0.06	0.23
Northeast 51st Street	0.02			0.02
Northwest 51st Street	0.00			0.00

Southeast 15th Avenue	0.25	0.20	0.11	0.56
Florida Turnpike	0.2			0.02
Total	126.00	71.94	31.04	
GRAND TOTAL				238.24

Table 4: Total Miles of Roads within Inundation Zones

Functional Class	SLR + Category 1		SLR + Category 3		SLR + Category 5		Total
	Road	Inundated	Road	Inundated	Road	Inundated	Countywide
	Segments		Segments		Segments		
	> 50% Inundated (total miles)	Portion (total miles)	> 50% Inundated (total miles)	Portion (total miles)	> 50% Inundated (total miles)	Portion (total miles)	
Urban Principal Arterial	0.49	0.32	6.51	6.19	15.84	15.18	417.63
Urban Major Arterial	5.90	4.86	19.36	17.15	46.42	44.11	275.05
Urban Collector	35.60	32.63	58.42	55.59	92.76	89.65	476.53
Local	140.44	127.16	345.21	331.42	639.84	627.43	5,368.84

Implications of Hurricane Storm Surge augmented by Sea Level Rise

Increased storm surge due to sea level rise on transportation routes in low-lying communities, may augment road flooding where the road base is lower than the surrounding land thereby acting as a natural flood conveyance system. Often observed in the barrier island communities, the lowest Intracoastal side streets commonly flood during rains. Flood levels and duration of flooding are further increased during astronomical high tides in areas reliant upon gravity stormwater management systems, which depend on the water elevation differential to move water off the streets and to the outfall. As the sea rises, the head pressure on the stormwater management system is reduced and flooding may become more frequent and longer in its duration.

Some roads are not affected by the tides, and have some type of drainage system to convey water off the roadway during rainstorms. However, as sea level rises, these drainage systems become less effective, causing longer and more frequent flooding. Increased rainfall intensity may further magnify the severity and frequency of flooding on roadways with a drainage system dependent on tidally controlled waters. Frequent rising and receding of floodwaters also causes some roads to be threatened by erosion. In some cases, the loss of a road parallel to the shore may remove the only road access to a particular area.

Whether street flooding is a serious problem or a minor nuisance depends on these factors discussed above. In the aftermath of a large scale disaster, the increased flooding levels and duration of flooding may impede access by emergency, law enforcement, and recovery officials. ^[1]

Historically Vulnerable Areas due to Roadway Flooding

The following section discusses areas within the identified sea level rise study area that are already known to local public works officials as being problematic areas for repetitive flood inundation. Areas that are routinely problematic could experience more frequent and severe flooding and repeated roadway damage in the future. These areas may provide the county, and the jurisdictions within, priority areas for incorporating adaptation strategies, particularly in the post-disaster environment.

West Palm Beach: Areas along Flagler Drive currently experience flooding during astronomical high tides as indicated in Figure 3. The Fiscal Year 2009-2015 Capital Improvements Schedule identifies stormwater drainage projects; however, it is not known if these projects include specific improvements for this area. The City may also wish to consider incorporating this area as a potential project for inclusion on the Prioritized Project List for the Palm Beach County Local Mitigation Strategy.

Lake Worth: The City currently experiences periodic inundation during astronomical high tides in the area along Palm Way between 12th Avenue North and 2nd Avenue South (Figure 3, middle panel). The stormwater management system within this area is a collector of stormwater draining from the northern part of a larger system. With

^[1] Source: Office of Maintenance, Florida Department of Transportation (January 2010) & U.S. Department of Transportation.

insufficient head pressure on the gravity dependent system, floodwaters are not able to drain efficiently.

South Palm Beach: The area on Ocean Avenue between South Palm Beach and Manalapan (Figure 3, right panel) currently suffers from frequent flooding issues as a result of road design and a gravity fed stormwater drainage system. There are plans to raise bulkheads with the intent of reducing long-term erosion caused by wave action.

Adaptation Strategies⁹

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact.

During the long-term planning process, it may also be beneficial for communities to consider appropriate uses within the Adaptation Action Areas. Transportation infrastructures within vulnerable areas and/or within designated Adaptation Action Areas may be hardened to withstand potential impacts from erosion over the life expectancy of the infrastructure systems. Providing specific designations for these vulnerable areas, similar to overlay districts, may reinforce the prioritization of adaptation opportunities post-disaster. Local

planners may evaluate existing transportation infrastructure within the Adaptation Action Area to identify areas of opportunities for future adaptation actions to ensure systems are sufficiently hardened to withstand potential impacts from erosion over the life expectancy of the infrastructure. Local planners may also ensure that planned transportation infrastructure within the Adaptation Action Area is appropriate within the projected range of sea level rise and meets the greater community sustainability goals.

Retreat: Retreat options include realigning the impacted highways to reflect the changes in the inundation areas. This will probably be the least feasible (and probably least popular) option for Palm Beach County due to dense existing development in the vulnerable areas along the north/south corridors. However, the post-disaster environment may provide opportunity to reevaluate the location and design of existing roadways during the repair of severely damaged or destroyed traffic systems. For high priorities areas, the Post-Disaster Redevelopment Plan may consider advanced regulatory triggers and policies for post-disaster implementation. These policies may



Figure 2: One Way Flow Valve

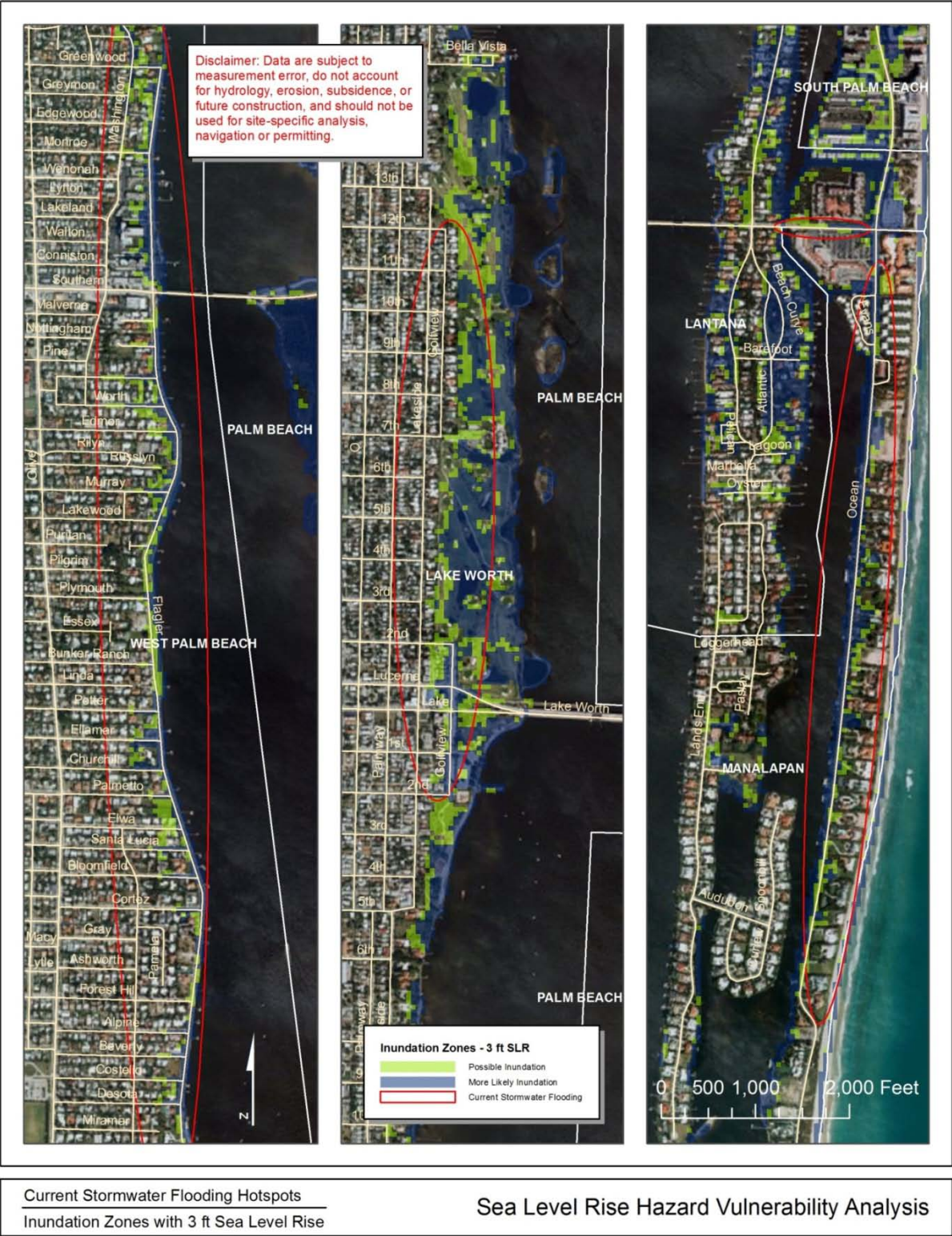
⁹ These mitigation strategies are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

provide authority to implement retreat strategies to relocate roadways out of areas of severe inundation.

Accommodation: Adaptation strategies in this category will likely provide politically and economically palatable options. Enhanced stormwater drainage systems in vulnerable areas may provide relief. The addition of stormwater pumping stations may delay the affects of sea level rise. Raising stormwater discharge areas to be above the level of projected high tide and adding one way flow valves (example in Figure 2) designed for tidal discharge are adaptation actions that risk areas such as the City of Lake Worth, the Town of Palm Beach, and the City of West Beach can employ. Cities may also want to work with FDOT to determine if the Base Clearance Water Elevation (BCWE) may be raised. This effort requires close collaboration between the roadway and drainage engineers Impacted jurisdictions may review their Capital Improvements Element of the Comprehensive Plan (and subsequent Capital Improvements Plan) for opportunities to incorporate policies that support sea level rise accommodation strategies.

Protection: Adaptation strategies which are protective, such as roadway elevations, are more effective when combined with accommodation strategies such as stormwater management enhancements. For roads along the rising water bodies, structural and nonstructural shoreline protection strategies may also provide relief for eroding roadways. Protection is generally considered the least effective strategy in the long-term, but when implemented in conjunction with accommodation and/or retreat, can provide the community with a more gradual transition to the impending realities of sea level rise and the inevitable, subsequent impacts.

Figure 3: StormWater Flooding Hotspots in Palm Beach County



Public Infrastructure and Utility Infrastructure Vulnerabilities and Redevelopment Strategies

Water Supply

Areas throughout the State of Florida have detected saltwater intrusion within the valuable fresh water aquifer. The South Florida Water Management District has determined that the salt water contamination threshold is 250 mg/l chlorides. A reading greater than this amount indicates possible saltwater intrusion into the area. The rising sea level and the increased demand for aquifer withdrawal will affect the rate of saltwater contamination. The “salt front” of the tidal saltwater wedge in coastal rivers, such as the Loxahatchee River, also will move further upstream as sea level rises. The distance will be a function of the river’s gradient as well as the amount of freshwater flow down the river and the tidal cycle. Upstream extension of the salt front in coastal rivers will affect both surface water intakes and well fields in aquifers that are recharged by river water. The potential for salt front migration to affect water supplies is a function of both river gradients and rainfall volumes.¹⁰ According to Jayantha Obeysekera of the South Florida Water Management District, the initial threat for this area is likely to be saltwater intrusion and the potential saltwater inundation impacts on utility well fields.

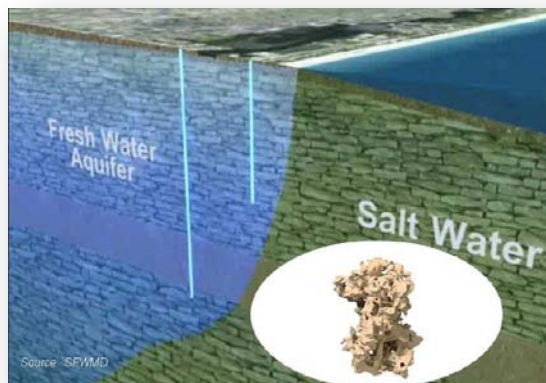


Figure 4: Saltwater Interface Zone

The surficial aquifer system that underlies Palm Beach County primarily consists of sand, clay, silt, shell, and limestone. Its thickness is variable (decreasing westward and northward) and is estimated to be as much as 400 feet in Palm Beach County. The surficial aquifer system is composed of several stratigraphic units. The main water producing zones of the surficial aquifer system vary in depth and location throughout the study area, but are relatively shallow. About 85 percent of Palm Beach County’s permitted groundwater withdrawal is pumped from depths of less than 150 feet. Additionally, hydraulic conductivity in the main water producing zones of the surficial aquifer system vary, but generally decrease to the north. The average hydraulic conductivities are estimated to be 1,600 feet/d (feet per day) in southeastern Palm Beach County and 150 feet/d in northeastern Palm Beach County. Figure 4 is a graphic model of the saltwater/groundwater interface zone.

Water Pumping Stations and Well Fields

Palm Beach County has a number of water monitoring points located throughout the county to test the groundwater for the presence of chlorides. They are mapped on Map

¹⁰ Adaptive Response Planning to Sea Level Rise in Florida and Implications for Comprehensive and Public Facilities Planning. Deyle, R.E., et. al., Florida Planning and Development Lab. Department of Urban and Regional Planning, Florida State University. Sept. 1, 2007.

4 in Appendix A. Palm Beach County obtains drinking water from one of the eighteen water pumping stations located throughout the county. Eight of these stations are located either within close proximity of the saltwater/groundwater interface zone or are actually on the east side of this interface zone. Most of these eight stations are located in the southern half of the county. Moreover, portions of well field zones from which these pumps draw water are also located on the east side of the interface and are currently at risk for saltwater intrusion. The impact of salt water intrusion rests largely on the speed of inundation. Climate change is expected to exacerbate groundwater salinisation processes in many of the areas where it has already occurred.¹¹

The estimate for rate of inundation is for every foot that the sea level increases, the saltwater intrusion line moves inward toward the aquifer approximately forty (40) feet. Additionally, the pumping of large volumes of water from the aquifer also promotes the inland migration of the saltwater intrusion. With sufficient notice, there may be enough time to change the treatment process or relocate the pumping stations to a location further west of the saltwater intrusion danger zone

In addition to the increase of salinity in the drinking water supply, there may also be related concerns of salinity in the gray water and wastewater reuse supply which is currently distributed for a variety of non potable uses, such as irrigation. Excessive salinity levels will also cause this water to be unusable.

Saltwater Intrusion during Hurricanes

Powerful storms can generate storm surges that inundate submerged storm-damaged water supply wells and contaminate boreholes (well casings and filter packs) in inundated low-lying areas. This can then lead to contamination of surrounding coastal aquifers. The risk of bore contamination is increased as sea-levels rise. (Carlson et al. 2007)¹². Hurricane Katrina in 2005 contaminated bore in southeastern Louisiana flooded by storm surges which required purging of far greater volumes of water than conventionally used to re-establish water quality in wells of this kind (approximately 200 casing volumes, Carlson et al., 2007).

Trends in Saltwater Interface Inundation

Urban development in Palm Beach, Martin and St. Lucie Counties has expanded rapidly in recent decades, resulting in a need for additional freshwater withdrawals from the surficial aquifer system, which is the primary source of drinking water for this tri-county area. Potable water demand for urban users is projected to increase 115 percent in Palm Beach County and 89 percent each in Martin and St. Lucie Counties from 1990 to 2010 (South Florida Water Management District, 1998). While population growth has slowed, the demand continues to increase. The increased demand on the coastal well fields, which draw water from the surficial aquifer system, may contribute to saltwater intrusion. There is limited data as to the location or movement of the saltwater interface in the tri-county area, with the exception of previously collected data in the immediate

¹¹ http://www.connectedwaters.unsw.edu.au/resources/articles/coastal_aquifers.html

¹² Carlson et al (2007). Storm-Damaged Saline-Contaminated Boreholes as a Means of Aquifer Contamination. Ground Water. Published on-line. doi: 10.1111/j.1745-6584.2007.00380.x

vicinity of the existing coastal well fields. It is possible that the combination of pumpage from the well fields and drainage caused by rivers and canals has a regional effect on the saltwater interface. In October 1996, the U.S. Geological Survey (USGS) entered into a cooperative study with the South Florida Water Management District (SFWMD) to determine the present location of the interface between freshwater and oceanic saltwater in the surficial aquifer system along the coast of southeastern Florida. The information presented below is taken from this report. Note that this study documents the position of the saltwater interface in the surficial aquifer system in 1997-98 through the evaluation of chloride and geophysical data.

Southeastern Palm Beach County¹³

The level of rainfall, ongoing drinking water pumping from the nearby coastal well fields, and the canal system are major factors that influence water levels and the movement of the saltwater interface in southeastern Palm Beach County. The Lake Worth Drainage District (LWDD) operates the largest canal system in southeastern Palm Beach County, covering an area of about 325 square miles. It lies within the area south of C-51, north of the Hillsboro Canal, west of Interstate 95 (I-95), and east of U.S. Highway 441. Water is maintained in the LWDD canals at levels ranging from 15.5 feet above sea level to tide level by way of a system of pumps and control structures within four large equalizing canals (north-south) and more than fifty (50) smaller lateral canals (east-west) (Shine and others, 1989). By maintaining water levels within the canals above sea level, the influence of saltwater intrusion can be reduced.

In much of this area, the base of the surficial aquifer system is one hundred (100) feet or more below the water supply production zones. The Boca Raton well fields lie north of Hillsboro Canal, which separates eastern Palm Beach and Broward Counties. A coastal structure (G-56) is situated on the canal slightly west of I-95. The inland position of this control structure results in greater drainage to the east, lowering water levels, and resulting in the inland movement of the saltwater interface. Boca Raton has eastern and western well fields, with most of the pumping coming from the western well fields. Water is pumped from the production zone of the eastern well fields at a depth above 120 feet below land surface. Surface-geophysical data indicates that the saltwater interface underlies the well field between 119 and 130 feet below land surface. Historical chloride data shows evidence of saltwater intrusion, with concentrations greater than 250 and 10,000 mg/L in wells PB-490 and PB-491, respectively.

In Highland Beach, the saltwater interface underlies the eastern part of the well field. The production zone for the well field is between 85 and 120 feet below land surface. Chloride concentrations in well PB-948 increased substantially from about 2,000 mg/L in 1977 to 7,800 mg/L in 1998. Delray Beach and Boynton Beach have western and eastern well fields with both eastern well fields located less than 0.5 miles west of the Intracoastal Waterway. In 1977, the saltwater interface was reported to be within 1,000

¹³ Hittle, C.D. 1999. "Water Resources Investigation Report 99-4214: Delineation of saltwater intrusion in the surficial aquifer system in eastern Palm Beach, Martin, and St. Lucie Counties, Florida, 1997 – 1998." U.S. Department of the Interior, U.S. Geological Survey.

feet laterally of the eastern well fields. Water from the Delray Beach eastern and western well fields is pumped at a depth above 130 feet below land surface.

In Boynton Beach, the saltwater interface underlies the eastern well field where water is pumped at a depth above 135 feet below land surface. Borehole-geophysical data for well PB-1195 indicates the saltwater interface is at about 105 feet below land surface east of the well field, and a chloride concentration of 13,250 mg/L (well PB-1736) was detected at a depth of 186 feet. Surface-geophysical data for site 1 indicate that the saltwater interface lies below the eastern well field at a depth of 190 feet below land surface.

Municipal water supply is limited to shallow aquifer pumping from a few production wells between Boynton Beach and Lake Worth. The Lake Worth well field lies less than 1 mile west of the saltwater interface. The steep slope of the saltwater interface in the Lake Worth area was noted in 1977. Water levels along the coast in Lake Worth are higher than in Delray Beach, Highland Beach, and Boca Raton and may affect the slope of the saltwater interface in this area. A segment of the Lake Worth monitoring well network consists of deep PVC-cased wells along an east-west transect between the well field and Intracoastal Waterway. Chloride and borehole-geophysical data indicates the saltwater interface is at the base of the surficial aquifer system near well PB-1723. The combination of deep wells, PVC casing, and wells located along an east-west transect resulted in a well-defined saltwater interface in the Lake Worth area.

Surface water from the West Palm Beach Water Catchment area, west of and including Lake Mangonia and Clear Lake, is used by the City of West Palm Beach for municipal water supply. A lack of wells in this area made surface-geophysical surveys the sole source of data used to evaluate the saltwater interface throughout West Palm Beach.

Northeastern Palm Beach County¹⁴

Fresh groundwater levels in northeastern Palm Beach County are primarily influenced by rainfall, pumping from the coastal well fields, the canal system, and the Loxahatchee River. The Riviera Beach well field has a production zone between 43 and 245 feet below land surface. Chloride concentrations in monitoring wells east of the water supply well field, wells PB-1726 and PB-1727, indicate that fresh water lies at 200 feet below land surface. Surface-geophysical data for sites 73 and 141 indicates the inland extent of the saltwater interface is about 1 mile west of wells PB-1726 and PB-1727. Chloride concentrations from the production wells do not indicate the presence of saltwater, and there are no deep monitoring wells within the well field to confirm the surface-geophysical results. Between Riviera Beach and Jupiter, three well fields are operated by Seacoast Utilities (Richards Road, Lilac Street, and Hood Road well fields). These well fields are all located west of the saltwater interface. The Richards Road well field is located farther east than the other two well fields and lies within 0.25 miles of the saltwater interface near structure S-44. More monitoring well data is needed in this area to better define the inland extent of the saltwater interface.

¹⁴ Ibid.

The Jupiter well field is near the southwest fork of the Loxahatchee River. Monitoring well and surface-geophysical data indicates that the saltwater interface is east of the well field. A chloride concentration of about 480 mg/L was detected in well PB-1730 at a depth of between 273 and 294 feet below land surface (Maps 4). Chloride concentrations indicate that freshwater is present at a depth of 253 feet in monitoring well PB-1732; however, surface-geophysical survey 45 shows that the saltwater interface is present at a depth of about 181 feet, and chloride concentrations slightly greater than 100 mg/L have been reported in the production wells just west of surface-geophysical site 45.

The Tequesta well field is located along the boundary of Palm Beach and Martin Counties and lies between the Intracoastal Waterway and the Loxahatchee River. The well field has a shallow production zone between 30 and 70 feet below land surface with the base of the surficial aquifer system at about 200 feet below sea level. Chloride concentrations were 4,200 mg/L in well PB-892 and 400 mg/L in well M-1319 at depths of 75 and 130 feet, respectively (Map 4). Surface-geophysical data from site 115 suggests that the area is underlain by saltwater at a depth of 105 feet, which is confirmed by earlier research that showed saltwater intruding into the existing well field. The inland position of the saltwater interface near Tequesta shows the effects of drainage (resulting in lower groundwater levels) from the Loxahatchee River.

*Adaptation Strategies*¹⁵

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact.

Protection: In some areas, well fields threatened by encroaching saltwater intrusion have been protected by reducing the permeability of sediments that lie between the sea and the well field and by enhancing freshwater recharge in the area that lies between the sea and the well field. Other options may include the protection of surface water supplies susceptible to salt front intrusion through the use of tidal gates where these do not interfere with navigation. Tide gates in water supply canals can prevent saltwater from migrating upstream and may be options for consideration in areas such as the Loxahatchee River. Protection options may also include engineered flow barriers (e.g., Southern Los Angeles), managed aquifer recharge and active management of catchment water balances - particularly by the use of vegetation cover that helps to maintain the equilibrium by transpiring water.¹⁶

Retreat: Options for retreat include the development of pumping stations and well fields or surface water sources that are further inland. This may be a more viable option for the northern part of the county where there is a large well field. Retreat options also

¹⁵ These mitigation strategies are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

¹⁶ Timms, W, Andersen, M.S. and Carley, J (2008). Fresh-saline groundwater boundaries below coastlines - potential impacts of climate change. Coast To Coast Crossing Boundaries Conference, 18-22 August, 2008, Darwin.

include restricting groundwater use or optimizing pumping locations and schedules to reduce the impact of extraction on the fresh-saline equilibrium.¹⁷

Accommodation: Strategies can include development of deeper brackish aquifers with attendant desalination and desalination of water from existing well fields as salt water intrusion occurs. Communities may also consider raising impacted bore heads to reduce the risk of bore flooding and desalination of saline bore water that has already contaminated coastal aquifers. Where other water sources are limited, this can be more efficient than desalinating raw seawater obtained directly from the ocean.¹⁸ Community leaders may want to consider promoting water conservation practices and technologies that reduce the amount of additional freshwater needed for water supply, such as the use of reclaimed water. The post-disaster environment can offer opportunities to advance infrastructure installation to support water conservation goals, such as the installation of reuse waterlines in areas that are prioritized for access to grey water. There are three (3) primary spillways located in sea level rise inundation zones in Palm Beach County. They are in North Palm Beach, Boynton Beach, and Highland Beach as seen on Map 4 in the Appendix. According to Jayantha Obeysekera, of the South Florida Water Management District, the initial threat for this area is likely to be saltwater intrusion and the potential saltwater inundation impacts on utility well fields. As more is understood about the hydrological impacts of hurricanes and saltwater intrusion in the aquifer it will be important to continue to monitor these impacts and evaluate adaptation strategies.

Hurricane storm surge impacted by sea level rise represents significant long-term challenges to the stormwater management systems throughout the county due to the complex, interdependent nature of stormwater infrastructure systems. These infrastructure components include stormwater sewers, catchment basins, drainage canals, and spillways. Rising groundwater elevations combined with rising sea levels may create drainage and flood control obstacles that cannot be resolved by any one entity or jurisdiction. The stormwater management systems have extensive inter-connectivity within the greater floodplains, land uses and area topography. Land use can dictate the requirement for levels of service. Highly populated areas may require a higher level of protection than open space.¹⁹ The imperviousness affects the amount of soil storage that is available, and the speed at which runoff leaves the catchment area in the form of stormwater. Some soil types have a greater ability to provide storage for stormwater runoff. Erosion prone soils may suffer increased erosion with increases in rainfall intensity, or changes in wetting/drying patterns.²⁰ The stormwater network will be affected by changes if the catchment has not managed the changes internally. The type of infrastructure in the catchment can also influence whether or not the effects will be significant.

¹⁷ Timms, W, Andersen, M.S. and Carley, J (2008). Fresh-saline groundwater boundaries below coastlines - potential impacts of climate change. Coast To Coast Crossing Boundaries Conference, 18-22 August, 2008, Darwin.

¹⁸ Timms, W, Andersen, M.S. and Carley, J (2008). Fresh-saline groundwater boundaries below coastlines - potential impacts of climate change. Coast To Coast Crossing Boundaries Conference, 18-22 August, 2008, Darwin.

¹⁹ Shaw, H., et. al., "Incorporating Climate Change into Stormwater Design – Why and How?" URS New Zealand Limited. Ministry for the Environment, North Shore City Council.

²⁰ Shaw, H., et. al., "Incorporating Climate Change into Stormwater Design – Why and How?" URS New Zealand Limited. Ministry for the Environment, North Shore City Council.

As with floodplains, the water levels in large, open channels may not be significantly affected by changes in flow. However, smaller infrastructure may be more sensitive to changes, and this, coupled with the consequences of failure (i.e., surrounding land use, availability of overland flow paths) may be considered when assessing the sensitivity of catchment areas to changes in sea level rise.²¹

Designers of coastal drainage systems recognize the unique characteristics of coastal flooding, particularly the impacts of tides, low elevations, and high groundwater tables. The rate at which gravity can drain an area depends in part on the difference in elevation between the area being drained and the place to which the water flows. The greater the difference in elevation, the greater the slope of the “hydraulic head” and the faster the water can drain.

Coastal areas generally are low-lying and, thus, vulnerable to flooding. High tides can decrease the elevation difference and further slow gravity drainage. Moreover, storm surges in coastal areas frequently occur during rainstorms, and can completely stop natural drainage. High water tables in coastal areas also limit natural drainage. With water tables just below the land surface, a rainstorm can rapidly saturate the soil (raise the water table to the surface). The saturated soil increases runoff by decreasing the ability of water to percolate into the ground.

Coastal flooding can also be exacerbated by problems frequently not considered in designing the drainage system. Storm waves may overtop a seawall; and sediment and debris may block inlets, outlets, and storm sewer pipes and canals. During the worst storm surges, coastal areas may be completely inundated by the sea, leaving the drainage system ineffective until water levels have receded. Areas that are currently below sea level require forced drainage.²²

Coastal flooding can be exacerbated by sea level rise in a variety of ways. Decreased hydraulic head and higher water tables could reduce both natural and artificial drainage. More areas may flood during astronomical high tides. Storm surges and storm surge inundation area may increase. Areas that were above sea level and relied on gravity drainage may find themselves below sea level and relying upon pumps to drain water. Natural drainage would be decreased both because (1) higher groundwater tables could decrease the ability of rainwater to percolate into the soil and (2) higher tailwater levels would slow the flow through drainage canals. The reduced natural drainage may increase the requirements of the man-made system of ditches, pipes, and/or canals. However, higher tailwaters would also reduce the capacity of these systems. Furthermore, the decreased flow rates would allow more siltation and deposition of debris, further reducing capacity or necessitating additional maintenance. Gravity drainage systems would be rendered less effective and require modifications to prevent

²¹ Shaw, H., et. al., “Incorporating Climate Change into Stormwater Design – Why and How?” URS New Zealand Limited. Ministry for the Environment, North Shore City Council.

²² Titus, James G., et. al. “Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems.” Journal of Water Resources Planning and Management. Vol. 113, No. 2., March 1987.

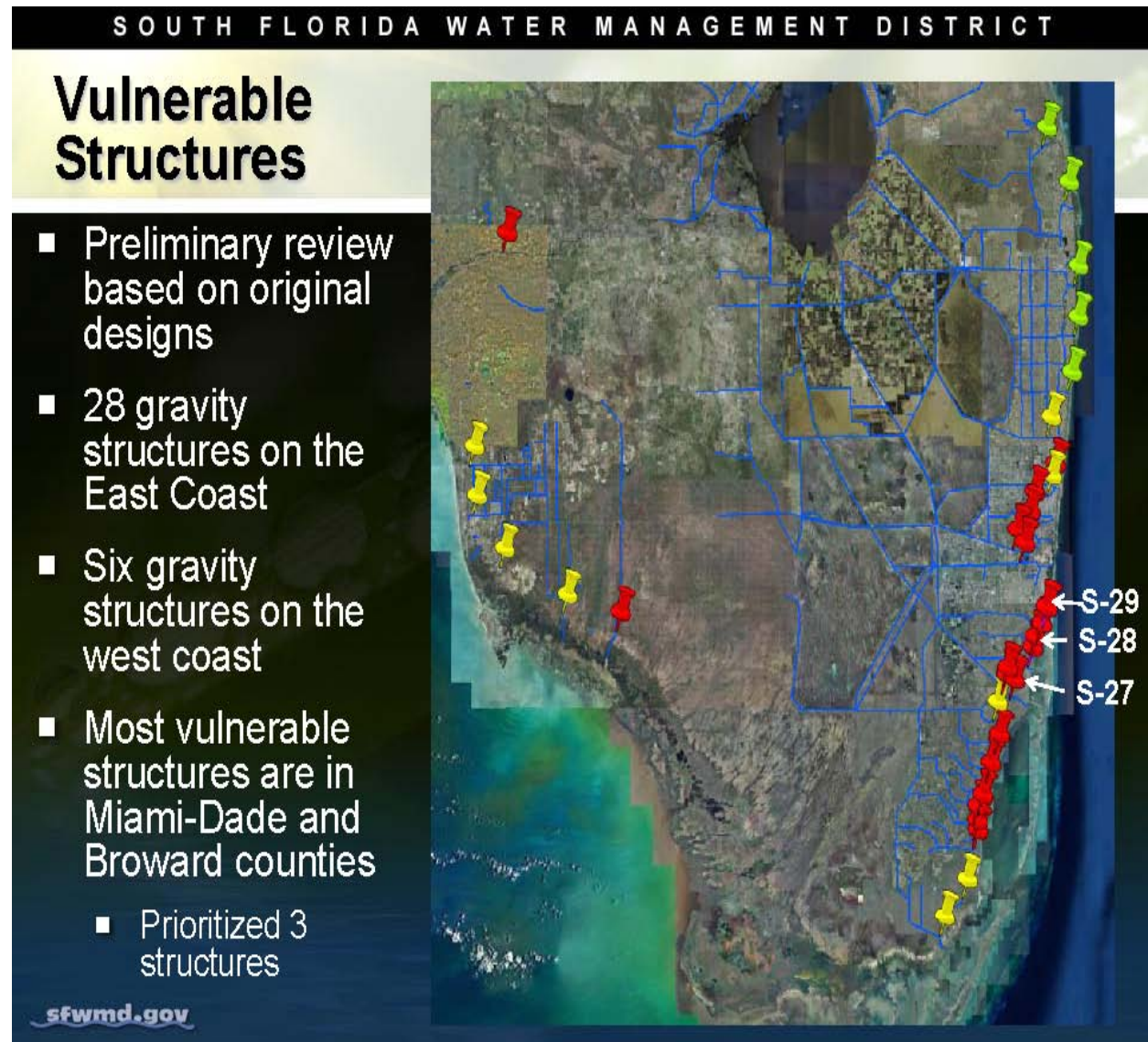
seawater from backing up into the communities that have been identified (see Maps 1 and 5 in the Appendix) as being inundated by sea level rise. In areas that are already below sea level, pumping stations would have to pump water farther upward, which would reduce pumping capacity.²³ The South Florida Water Management District operates water management infrastructure and regional water control structures near the coast and throughout the South Florida region. The canal networks in Palm Beach County are typically maintained at predetermined water levels in order to reduce saltwater intrusion into the well fields that provide drinking water and to provide flood protection. Water control structures maintain these water levels within the canals. When these structures discharge to the ocean, the water level difference between upstream (land side or headwater) and downstream (ocean side or tailwater) may be as little as 6 inches or less for some structures. When the difference is 6 inches or less, the structures will not operate properly. The South Florida Water Management District stated that projected sea level rise may reduce the flood discharge capacity of coastal structures, thus affecting flood protection in urban areas. The location of existing District coastal structures potentially impacted by sea level rise is shown in Figure 5 below. None of the highly vulnerable structures identified are located in Palm Beach County. (High vulnerability structures are red, medium vulnerability are orange, and low vulnerability are green²⁴. (Map produced by the South Florida Water Management District.) In other words, the structures in Palm Beach County have larger adaptive capacities. The District does not have immediate plans to modify or construct additional water control structures in this County. Additional adaptation strategies will be evaluated over the next few years to accommodate changing environmental conditions.²⁵

²³ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

²⁴ Climate Change and Water Management in South Florida, Interdepartmental Climate Change Group, SFWMD, November 12, 2009.

²⁵ Obeysekera, Jayantha. Hydrologic & Environmental Systems Modeling, South Florida Water Management, email dated September 2, 2011.

Figure 5: South Florida Water Management District Operated Vulnerable Structures



The loss of wetlands expected to result from sea level rise could increase flooding in some areas while decreasing it in others. By reducing hydraulic roughness (e.g., by lining it with asphalt or concrete) it would improve the natural drainage of rainwater. On the other hand, wetland loss would remove an important natural barrier to storm surges.²⁶

The full impacts of sea level rise on the stormwater management system are not sufficiently understood to target specific adaptation strategies. In order to maintain stormwater runoff rates, levels compatible with safe conveyance capacities of receiving waters, it will be necessary to perform more detailed hydrological evaluation of the stormwater management system. It is also recommended that each jurisdiction inventory stormwater treatment, delivery and collection systems; assess the status of each component; determine the potential impact from sea level rise; and develop different sea level rise scenarios and adaptation strategies for high-risk utilities and/or infrastructure, which may require replacement, reinforcement, or relocation to ensure the long-term viability of the system.

With regard to stormwater drainage, the potential responses to drainage problems caused by sea level rise and increased precipitation fall broadly into three categories: enhanced gravity drainage, forced drainage, and adaptation to increased flooding. These measures vary in the extent to which implementation requires anticipation of future sea level rise rather than reacting as it happens.²⁷

Gravity drainage can be enhanced by increasing stormwater flow capacity and/or augmenting storage capacity. This may be achieved by installing larger pipes, widening drainage channels, supplementing pipe systems and replacing antiquated, undersized pipes with new, larger pipes. Communities with important drainage canals may consider increasing storage capacity within these systems to include deepening the canal, widening the canal, routing spillways to increase capacity and/or adding retention area capacities. Although, the widening itself need not take place until drainage problems occur, it may be prudent to ensure that buildings and roads are not put so close to the canal that future widening is impossible. The gravity drainage can also be improved by deepening a particular canal or by reducing its hydraulic roughness. These methods require less anticipation; but they are relatively expensive, and may pose safety, aesthetic, or environmental problems.²⁸ The post-disaster environment may provide an opportune time for incorporating greater capacity in anticipation of sea level rise. Older infrastructure is typically at greater risk for failing as a result of a natural disaster. During the reconstruction process, communities may consider eligibility for public assistance and hazard mitigation funding to address infrastructure shortfalls, increase community resilience, and long-term sustainability.

²⁶ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

²⁷ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

²⁸ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

Because of the low elevations of coastal areas, gravity drainage is not always possible. To be drained by gravity, a road must not only be above sea level, but must have sufficient elevation for drainage pipes underneath to have adequate cover and be above sea level. Thus, many areas have forced drainage (pumps). As sea level rises, some areas that currently have gravity drainage may have to shift to forced drainage. Locks and flap gates may provide a cost-effective interim solution for such areas. During low tide, the gates could be open to permit gravity drainage, while during high tides they could be closed.²⁹

Areas that currently use forced drainage will also require modifications. Larger pumps may be necessary to work against the higher tailwaters and to handle the larger capacity resulting from decreased natural drainage and percolation, and possibly increased runoff. While new systems may require larger pumps, existing systems are more likely to use additional pumps. In addition to increasing pump capacity, it will often be necessary to increase the capacity of the system that delivers the stormwater to the pumping station.³⁰

Detention basins are widely used to control surface runoff in urban and suburban areas. The concept of detention can be applied in ways other than detention basins, such as rooftop detention, infiltration trenches, porous pavement, storage in low playgrounds and parking lots, and in-line storage in the storm sewer pipes. As the drainage capacities of storm sewer pipe systems, drainage channels, and pumping facilities decrease with sea level rise, one alternative design would be to include more detention facilities in the drainage basin, preferably located near the headwaters of the basin. The detention scheme would be able to reduce the peak discharge, delay the peak time of a storm, and therefore reduce the flow loading onto the storm sewer pipes, drainage channels, and pump station. After the storm has ended, the runoff volume stored in the detention facilities could then be released gradually into the drainage systems without exceeding its capacity.³¹

Besides improving their drainage systems to prevent flooding, communities might choose to implement a combination of planning and structural measures to adapt to increased flooding. Buildings in low areas can be made flood resistant and new buildings and streets can be constructed at higher elevations. At some point it might be necessary to discourage building in the increasingly flood prone areas or to limit the type of construction. Existing coastal management programs that do so include reduced government subsidies, zoning measures, and higher flood insurance rates.³²

²⁹ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

³⁰ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

³¹ Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

³² Titus, James G., et. al. "Greenhouse Effect, Sea Level Rise, and Coastal Drainage Systems." *Journal of Water Resources Planning and Management*. Vol. 113, No. 2., March 1987.

Protection: Policies that support protection strategies can include the establishment of requirements for stabilizing vegetation on berms in shallow waters offshore. Other alternatives may include creating breaks and adjusting the height of berms to allow tidal flow, and in spaces between mainland and offshore plantings establish salt marsh grasses or other appropriate species. The depositing of sediment at a rate required to allow plantings to adapt to the rate of sea level rise (rate of SLR minus accretion rate of plantings) can also provide elements of shoreline protection. Jurisdictions who have critical facilities located within high risk areas, may also consider the development of continuity of operations plans for these facilities in order to ensure that all critical life safety functions can be continuously performed.

Public Facility Vulnerabilities and Redevelopment Strategies

When factoring in the increased surge inundation during hurricanes as a result of sea level rise, facilities previously sited in safe areas (e.g. outside the FEMA 100-year floodplain) may become exposed to floodwaters with higher return frequencies. Tables 5 and 6 detail the critical facilities and public facilities located within the inundation zones primarily within municipal boundaries. These include a variety of structures such as government facilities, fire stations, schools, healthcare facilities and others. Following is a listing of the cities with the most potential impacts to public and critical facilities:

- Jupiter 15 Facilities
- West Palm Beach 10 Facilities
- Palm Beach Gardens 9 Facilities
- Palm Beach 8 Facilities
- Boca Raton 8 Facilities
- Riviera Beach 6 Facilities
- Tequesta 6 Facilities

For additional information regarding the location and cost of these facilities see Tables 5 and 6. Water control structures designed to withstand the force of storm waves and moving floodwaters of a given intensity will be more likely subjected to stronger forces. The level of flood protection previously afforded by the elevation or flood proofing of infrastructure and structures, therefore, may likely be reduced as sea level rises. Seawalls, bulkheads, revetments, and levees built to provide flood protection to public facilities and infrastructure may be over-topped more frequently. Drainage canals and ditches may be increasingly inundated resulting in increased floodwater drainage rates from interior areas. The Southeast Florida Regional Climate Change Compact identified critical facilities impacted by a rise in sea level.

Table 5: Critical Facilities within the Inundation Zones

Priority	Jurisdiction	Facility Type	Zone	Facility Name	Address	Est. Value
CRITICAL	PALM BEACH	LANDFILL	3 FT SLR	TOWN OF PALM BEACH TRANSFER STATION	45 COCOANUT ROW	\$ 2,621,335
CRITICAL	PALM BEACH	SCHOOL	3 FT SLR	PALM BEACH PUBLIC	239 COCOANUT ROW	\$ 10,128,350
CRITICAL	WEST PALM BEACH	HOSPITAL	3 FT SLR	GOOD SAMARITAN MEDICAL CENTER	1300 N FLAGLER DR	\$ 32,000,000
CRITICAL	CITY OF HYPOLUXO	UTILITY	CAT 3 + SLR	MANALAPAN WTP	7000 FEDERAL HIGHWAY	\$ 367,983
CRITICAL	JUPITER	SCHOOL	CAT 3 + SLR	JUPITER	200 S LOXAHATCHEE DR	\$ 9,833,784
CRITICAL	RIVIERA BEACH	PORT	CAT 3 + SLR	PORT OF PALM BEACH	1 E 11TH ST	\$ 16,880,124
CRITICAL	RIVIERA BEACH	UTILITY	CAT 3 + SLR	RIVIERA	200 BROADWAY	\$ 8,036,012
CRITICAL	BOCA RATON	HOSPITAL	CAT 5 + SLR	BOCA RATON COMMUNITY	800 MEADOWS RD	\$ 40,125,744
CRITICAL	BOCA RATON	SCHOOL	CAT 5 + SLR	BOCA RATON	1251 NW 8TH ST	\$ 14,258,889
CRITICAL	BOCA RATON	SCHOOL	CAT 5 + SLR	ADDISON MIZNER	SW 12TH AVE	\$ 121,260
CRITICAL	JUPITER	HOSPITAL	CAT 5 + SLR	JUPITER MEDICAL CENTER	1210 S OLD DIXIE HWY	\$ 27,799,327
CRITICAL	JUPITER	SCHOOL	CAT 5 + SLR	BEACON COVE	150 SCHOOLHOUSE RD	\$ 7,710,970
CRITICAL	JUPITER	SCHOOL	CAT 5 + SLR	JUPITER	15245 MILITARY TRL	\$ 10,952,575
CRITICAL	JUPITER	SCHOOL	CAT 5 + SLR	LIGHTHOUSE	4750 DAKOTA DR	\$ 5,663,383
CRITICAL	JUPITER	SCHOOL	CAT 5 + SLR	JUPITER	500 MILITARY TRL	\$ 35,143,193
CRITICAL	JUPITER	SCHOOL	CAT 5 + SLR	JERRY THOMAS	800 MAPLEWOOD DR 101E	\$ 8,220,416
CRITICAL	NORTH PALM BEACH	SCHOOL	CAT 5 + SLR	NORTH PALM BEACH	401 ANCHORAGE DR	\$ 2,103,873
CRITICAL	PALM BEACH GARDENS	HOSPITAL	CAT 5 + SLR	PALM BEACH GARDENS MEDICAL CENTER	3360 BURNS RD 200	\$ 20,000,000
CRITICAL	PALM BEACH GARDENS	SCHOOL	CAT 5 + SLR	ALLAMANDA	10300 ALLAMANDA DR	*
CRITICAL	PALM BEACH GARDENS	SCHOOL	CAT 5 + SLR	DWIGHT D. EISENHOWER	2936 LONE PINE RD	\$ 10,990,562
CRITICAL	TEQUESTA	UTILITY	CAT 5 + SLR	TEQUESTA WTP	901 OLD DIXIE HWY	\$ 1,512,167

Table 6: Public Facilities (non-critical) within Inundation Zones

Priority	Jurisdiction	Facility Type	Zone	Facility Name	Address	Est. Value
OTHER	BRINY BREEZES (BOYNTON BEACH)	GOV	CAT 1 + SLR	BRINY BREEZES TOWN HALL	5000 N OCEAN BLVD	VACANT
OTHER	OCEAN RIDGE	EOC/GOV/PD	CAT 1 + SLR	OCEAN RIDGE EOC/TOWN HALL/PD	6450 N OCEAN BLVD	\$ 1,238,870
OTHER	PALM BEACH	LIB	CAT 1 + SLR	FOUR ARTS THE SOCIETY OF LIBRARY	3 FOUR ARTS PLAZA	\$ 7,950,607
OTHER	RIVIERA BEACH	FIRE	CAT 1 + SLR	RIVIERA BEACH FIRE DEPARTMENT STATION #3	5010 N OCEAN DR	\$ 2,975,825
OTHER	SOUTH PALM BEACH	GOV	CAT 1 + SLR	SOUTH PALM BEACH TOWN HALL	3577 S OCEAN BLVD BLDG 1	*
OTHER	WEST PALM BEACH	LIB	CAT 1 + SLR	WEST PALM BEACH LIBRARY	100 N CLEMATIS ST	\$ 10,217,270
OTHER	DELRAY BEACH	FIRE	CAT 1 + SLR	DELRAY BEACH FIRE DEPARTMENT STATION #2	35 ANDREWS AVE	\$ 2,908,215
OTHER	DELRAY BEACH	FIRE	CAT 1 + SLR	DELRAY BEACH FIRE DEPARTMENT STATION #6	3612 S OCEAN BLVD	\$ 559,742
OTHER	DELRAY BEACH	SNF	CAT 1 + SLR	HARBOURS EDGE	401 E LINTON BLVD	\$ 35,272,313
OTHER	GULF STREAM	EOC/PD	CAT 1 + SLR	GULFSTREAM EOC/PD	246 SEA RD	\$ 1,074,255
OTHER	HIGHLAND BEACH	EOC/PD	CAT 1 + SLR	HIGHLAND BEACH EOC/PD	3614 S OCEAN BLVD BLDG 1	\$ 5,328,033
OTHER	JUPITER	FIRE	CAT 1 + SLR	PALM BEACH COUNTY FIRE RESCUE STATION #18	351 S US HIGHWAY 1	\$ 4,308,451
OTHER	LAKE WORTH	ALF	CAT 1 + SLR	PALM BEACH CLUB, LLC	450 E OCEAN AVE	\$ 20,905,166
OTHER	MANALAPAN	EOC/FIRE/GOV/PD	CAT 1 + SLR	MANALAPAN EOC/FIRE STATION #38/TOWN HALL/PD	600 S OCEAN BLVD	\$ 990,183
OTHER	PALM BEACH	EOC/FIRE	CAT 1 + SLR	PALM BEACH EOC/FIRE	360 S COUNTY RD BLDG 1	\$ 4,754,459
OTHER	PALM BEACH	FIRE	CAT 1 + SLR	PALM BEACH FIRE DEPARTMENT STATION #3	2185 S OCEAN BLVD	\$ 22,986,691
OTHER	PALM BEACH	FIRE	CAT 1 + SLR	PALM BEACH FIRE DEPARTMENT STATION #2	300 N COUNTY RD	\$ 2,234,329
OTHER	RIVIERA BEACH	ALF	CAT 1 + SLR	HARBOR HOUSE RESORT	2637 WEST WAY A	\$ 276,165
OTHER	SOUTH PALM BEACH	EOC/PD	CAT 1 + SLR	SOUTH PALM BEACH EOC/PD	3577 S OCEAN BLVD BLDG 2	\$ 1,867,991
OTHER	BOCA RATON	FIRE	CAT 3 + SLR	BOCA RATON FIRE DEPARTMENT STATION #3	100 S OCEAN BLVD	\$ 8,792,100
OTHER	BOCA RATON	SNF	CAT 3 + SLR	FOUNTAINS NURSING HOME	3800 N FEDERAL HWY	\$ 1,043,571
OTHER	BOYNTON BEACH	ALF	CAT 3 + SLR	RUSTIC RETREAT RETIREMENT HOME	1120 N FEDERAL HWY	\$ 568,829
OTHER	BOYNTON BEACH	ALF	CAT 3 + SLR	GARDENS AT BOYNTON VILLAGE	1935 S FEDERAL HWY	\$ 5,000,000

Priority	Jurisdiction	Facility Type	Zone	Facility Name	Address	Est. Value
OTHER	BOYNTON BEACH	FIRE	CAT 3 + SLR	BOYNTON BEACH FIRE DEPARTMENT STATION #4	1919 S FEDERAL HWY	\$ 1,206,912
OTHER	JUNO BEACH	SNF	CAT 3 + SLR	WATERFORD HEALTH CARE CENTER	601 UNIVERSE BLVD	\$ 21,625,464
OTHER	JUPITER	ALF	CAT 3 + SLR	MANGROVE BAY	110 MANGROVE BAY WAY 1101	\$ 11,585,382
OTHER	JUPITER	GOV/PD	CAT 3 + SLR	JUPITER TOWN HALL/PD	210 MILITARY TRL	\$ 15,561,523
OTHER	JUPITER INLET COLONY	EOC/PD	CAT 3 + SLR	JUPITER INLET COLONY EOC/PD	1 COLONY RD	\$ 46,172
OTHER	NORTH PALM BEACH	EOC/GOV/PD	CAT 3 + SLR	JUNO BEACH EOC/TOWN HALL/PD	340 OCEAN DR	\$ 1,736,511
OTHER	PALM BEACH	GOV	CAT 3 + SLR	PALM BEACH TOWN HALL	360 S COUNTY RD BLDG 2	\$ 10,000,000
OTHER	PALM BEACH	PD	CAT 3 + SLR	PALM BEACH PD	345 S COUNTY RD	\$ 6,723,296
OTHER	PALM BEACH GARDENS	ALF	CAT 3 + SLR	PROSPERITY OAKS	11381 PROSPERITY FARMS RD 101	\$ 16,612,613
OTHER	PALM BEACH GARDENS	SNF	CAT 3 + SLR	HEARTLAND HEALTH CARE CENTER - PROSPERITY OAKS	11375 PROSPERITY FARMS RD 101	\$ 3,047,475
OTHER	RIVIERA BEACH	ALF	CAT 3 + SLR	SEAGULL PLACE	1233 ISLAND RD	\$ 337,220
OTHER	RIVIERA BEACH	EOC/FIRE/PD/GOV	CAT 3 + SLR	PALM BEACH SHORES EOC/FIRE/PD/TOWN HALL	247 EDWARDS LN	\$ 6,924,594
OTHER	WEST PALM BEACH	ALF	CAT 3 + SLR	GARDEN VILLAS	912 N OLIVE AVE 1	\$ 333,664
OTHER	WEST PALM BEACH	ALF/SNF	CAT 3 + SLR	LOURDES PAVILION	311 S FLAGLER DR	\$ 24,971,831
OTHER	WEST PALM BEACH	GOV	CAT 3 + SLR	WEST PALM BEACH CITY HALL	200 2ND ST	\$ 10,272,935
OTHER	WEST PALM BEACH	LIB	CAT 3 + SLR	TEMPLE ISRAEL LIBRARY OF JUDAICA	1901 N FLAGLER DR	\$ 2,813,887
OTHER	BOCA RATON	FIRE	CAT 5 + SLR	BOCA RATON FIRE DEPARTMENT STATION #8	190 SW 18TH ST	\$ 1,708,575
OTHER	BOCA RATON	FIRE	CAT 5 + SLR	BOCA RATON FIRE DEPARTMENT STATION #2	903 W PALMETTO PARK RD	\$ 51,700
OTHER	BOCA RATON	HOSPICE	CAT 5 + SLR	HOSPICE BY THE SEA, INC.	1531 W PALMETTO PARK RD	\$ 2,881,903
OTHER	BOYNTON BEACH	ALF	CAT 5 + SLR	BOYNTON BEACH ALF	1708 NE 4TH ST	\$ 2,785,100
OTHER	CITY OF HYPOLUXO	GOV	CAT 5 + SLR	HYPOLUXO TOWN HALL	7580 S FEDERAL HWY	\$ 297,608
OTHER	GULFSTREAM TOWN OF	GOV	CAT 5 + SLR	GULF STREAM TOWN HALL	100 SEA RD	*
OTHER	JUPITER	ALF	CAT 5 + SLR	MORNING STAR OF JUPITER INC #2	1104 SIOUX ST	\$ 175,817
OTHER	JUPITER	FIRE	CAT 5 + SLR	PALM BEACH COUNTY FIRE RESCUE, ST. 16	3550 MILITARY TRL	\$ 871,631
OTHER	JUPITER	LIB	CAT 5 + SLR	JUPITER BRANCH LIBRARY (PBCLS)	705 MILITARY TRAIL	\$ 2,918,670

Priority	Jurisdiction	Facility Type	Zone	Facility Name	Address	Est. Value
OTHER	JUPITER	SNF	CAT 5 + SLR	JUPITER MEDICAL CENTER PAVILION INC	1230 S OLD DIXIE HWY	\$ 4,754,515
OTHER	JUPITER	SNF	CAT 5 + SLR	JUPITER CARE CENTER	17781 THELMA AVE	\$ 2,928,851
OTHER	NORTH PALM BCH	EOC/FIRE/PD/GOV	CAT 5 + SLR	NORTH PALM BEACH EOC/FIRE/PD	560 US HIGHWAY 1	\$ 2,879,207
OTHER	NORTH PALM BCH	GOV	CAT 5 + SLR	NORTH PALM BEACH VILLAGE HALL	501 US HIGHWAY 1	\$ 1,360,291
OTHER	NORTH PALM BCH	LIB	CAT 5 + SLR	NORTH PALM BEACH PUBLIC LIBRARY	303 ANCHORAGE DR	\$ 3,073,537
OTHER	PALM BEACH GARDENS	ALF/SNF	CAT 5 + SLR	INN AT LA POSADA/NURSING CENTER	3600 MASTERPIECE WAY	\$ 28,000,000
OTHER	PALM BEACH GARDENS	FIRE	CAT 5 + SLR	PALM BEACH GARDENS FIRE RESCUE, ST. 62	11025 CAMPUS DR	\$ 793,115
OTHER	PALM BEACH GARDENS	GOV	CAT 5 + SLR	NORTH COUNTY COURTHOUSE	3188 PGA BLVD	\$ 18,197,609
OTHER	PALM BEACH GARDENS	LIB	CAT 5 + SLR	NORTH COUNTY REGIONAL LIBRARY (PBCLS)	11303 CAMPUS DR	\$ 6,674,216
OTHER	TEQUESTA	ALF	CAT 5 + SLR	STERLING HOUSE OF TEQUESTA	205 VILLAGE BLVD	\$ 1,805,400
OTHER	TEQUESTA	ALF	CAT 5 + SLR	CLARE BRIDGE OF TEQUESTA	211 VILLAGE BLVD	\$ 1,805,400
OTHER	TEQUESTA	EOC	CAT 5 + SLR	TEQUESTA	596 N US HIGHWAY 1	\$ 1,512,167
OTHER	TEQUESTA	FIRE/GOV/PD	CAT 5 + SLR	TEQUESTA FIRE RESCUE/VILLAGE HALL/PD	357 TEQUESTA DR	\$ 3,978,503
OTHER	TEQUESTA	LIB	CAT 5 + SLR	TEQUESTA BRANCH LIBRARY (PBCLS)	461 OLD DIXIE HWY	\$ 3,557,896
OTHER	WEST PALM BEACH	ALF	CAT 5 + SLR	WINDSOR COURT	3700 N FLAGLER DR 101	\$ 2,008,956
OTHER	WEST PALM BEACH	ALF	CAT 5 + SLR	WYNDHAM HOUSE	417 WESTWOOD RD	\$ 442,851
OTHER	WEST PALM BEACH	FIRE	CAT 5 + SLR	WEST PALM BEACH FIRE DEPARTMENT STATION #1	500 N DIXIE HWY	\$ 3,484,672
OTHER	WEST PALM BEACH	GOV	CAT 5 + SLR	GOVERNMENTAL CENTER	301 N OLIVE AVE	\$ 35,242,432
OTHER	WEST PALM BEACH	GOV	CAT 5 + SLR	CRIMINAL JUSTICE BLDG	421 3RD ST	\$ 22,091,927

*The data which was employed for this table was derived from the Palm Beach County Property Appraiser. Gaps in the estimated value column were not included in the source data files.

Adaptation Strategies

As with possible adaptation strategies that might be considered for roads, adaptation to protect public facilities may involve implementation of a combination of accommodation, protection, and retreat strategies over time. All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact

Retreat: There are a variety of options for implementing retreat adaptation strategies. Strategies that can support planned retreat may include implementing a program for removal of inundated structures, infrastructure, and incorporation of established hazard mitigation techniques as outlined in the Local Mitigation Strategy. Developing incentives for removal of existing shoreline structures may also support retreat. The post-disaster environment may provide a window of opportunity to implement retreat policies. Infrastructure components and publicly owned facilities may require costly reconstruction to the current building code. The community leadership may consider reevaluating the use of public funds and associated wise stewardship of these funds in highly vulnerable areas. The Post-Disaster Redevelopment Plan may incorporate decision making triggers and policies that reflect controversial adaptation priorities.

Accommodation: Design guidelines may be created for construction and land use in areas likely to be inundated by storm surge, rising sea levels, or identified as Adaptation Action Areas. For example, publicly owned marinas may be at greater risk for damage and destruction from increased wave action during a hurricane. The increased pressure underneath these structures causes them to break apart resulting in excessive debris following a storm. By requiring that docks be constructed higher and attached in a stronger manner to pilings, docks may be able to accommodate the impacts of sea level rise in a more resilient manner. The post-disaster environment may provide an even greater opportunity to implement accommodation measures in an already damaged environment that is in need of restoration.

Accommodation could include design guidelines and land use policies that:

- Are water dependent, temporary, adaptable, or evolve as sea levels rise;
- Are financially sustainable;
- Allow natural shoreline and ecosystem processes to continue;
- Integrate good waterfront design principles;
- Develop incentives for creative reuse.

Economic Vulnerability and Redevelopment Strategies

Sea level rise does not only have an impact on the physical, tangible assets which have been discussed up to this point. Palm Beach County is heavily dependent on tourism as a major economic base. Sea level rise poses a potential loss of assets and resources that support tourism, unless the county can develop creative ways to adjust. Economic data from the 2010 Census is presented below in Tables 7, 8 and 9 for three of the jurisdictions located in the northern part of the county³³ which could be significantly impacted by storm surge augmented by sea level rise.

Table 7: Jupiter Employees and Revenues	
Employers	1,815
Annual Revenue	\$2,868,617,000
Employees	17,459
Annual Payroll	\$599,862,000

Table 8: North Palm Beach Employees and Revenues	
Employers	326
Annual Revenue	\$238,214,000
Employees	1,714
Annual Payroll	\$58,167,000

Table 9: Palm Beach Employees and Revenues	
Employers	729
Annual Revenue	\$1,326,146,000
Employees	9,415
Annual Payroll	\$311,412,000

Implications of Hurricane Storm Surge augmented by Sea Level Rise

Initial examination of the study area indicates there will not be widespread loss of resources, such as structures along the beach. Marinas will likely be able to accommodate sea level rise by raising their docks, installing floating docks, and raising sea walls. And although the county may not experience a total loss of beach areas, the total acreage of beach area that will be available may be diminished, resulting in a narrower strip of beach available. This may in turn cause the area to become less attractive to tourists and result in the county generating less revenue in tourism-related dollars.

³³ Data for jurisdictions in the south end has not been made available from the Census Bureau as of this writing.

Potential Vulnerabilities

The data in Table 10 highlight potential business sectors that experience an impact from sea level rise.

Table 10: 2007 Economic Survey of Businesses (Jupiter, North Palm Beach, Palm Beach)

Jupiter

Industry Sector	NAICS code	Employers	Annual revenue (\$1,000)	Employees	Annual payroll (\$1,000)
Manufacturing	31-33	57	515,673	1,127	62,485
Wholesale trade	42	89	401,616	769	42,371
Retail trade	44-45	291	828,519	3,544	84,990
Information	51	24	N	283	12,090
Real estate and rental and leasing	53	159	89,959	697	24,969
Professional, scientific, and technical services	54	391	258,644	1,680	89,662
Administrative and Support and Waste Mang and Remediation Srvs	56	152	102,637	1,210	43,193
Educational services	61	22	5,356	91	1,640
Health care and social assistance	62	269	387,701	3,010	143,892
Arts, entertainment, and recreation	71	46	72,423	1,168	30,131
Accommodation and food services	72	138	131,983	2,925	39,004
Other services (except public administration)	81	177	74,106	955	25,435
TOTAL		1815	2,868,617	17,459	599,862

North Palm Beach

Industry Sector	NAICS code	Employers	Annual revenue (\$1,000)	Employees	Annual payroll (\$1,000)
Wholesale trade	42	12	22,801	31	1,802
Retail trade	44-45	47	75,478	255	8,707
Information	51	5	N	13	1,222
Real estate and rental and leasing	53	35	13,878	94	3,754
Professional, scientific, and technical services	54	93	42,808	320	16,392
Administrative and Support and Waste Mang and Remediation Srvs	56	27	13,159	111	2,490

Educational services	61	1	D	a	D
Health care and social assistance	62	42	29,341	291	12,876
Arts, entertainment, and recreation	71	10	11,287	74	1,538
Accommodation and food services	72	26	15,186	363	4,536
Other services (except public administration)	81	28	14,276	162	4,850
TOTAL		326	238,214	1,714	58,167

Palm Beach

Industry Sector	NAICS code	Employers	Annual revenue (\$1,000)	Employees	Annual payroll (\$1,000)
Wholesale trade	42	16	51,408	92	5,643
Retail trade	44-45	203	441,514	1,441	56,684
Information	51	5	N	12	798
Real estate and rental and leasing	53	99	99,013	368	15,099
Professional, scientific, and technical services	54	155	127,604	627	41,038
Administrative & Support, Waste Mgt. & Remediation Services	56	33	26,732	268	14,835
Educational services	61	2	D	a	D
Health care and social assistance	62	22	28,307	140	10,857
Arts, entertainment, and recreation	71	25	74,870	1,373	29,747
Accommodation and food services	72	41	300,191	3,853	103,299
Other services (except public administration)	81	128	176,507	1,241	33,412
TOTAL		729	1,326,146	9415	311,412

N = no data

D = data withheld for confidentiality

a = 0-19

<http://factfinder.census.gov>

*Adaptation Strategies*³⁴

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact.

Retreat: Businesses which are water-based and/or water-dependent, have limited adaptation options to retreat to areas without water frontage or access. Non water-dependent businesses located in the proximity of shoreline retreat or areas of severe inundation may be encouraged to work with community leaders and planners to identify safer, appropriate commercial land. It is important to note that private property rights and shoreline management practices remain in direct conflict at the discretion of local government.

Accommodation: Water-dependent businesses, such as marinas or businesses that have marina facilities (e.g., restaurants and hotels), generate significant revenue for the local governments. By incorporating design techniques such as heightened and hardened dock design when renovating or adding these structures, water-dependent businesses may continue to thrive.

Protection: Protective measures such as increasing the height of seawalls and bulkheads may be an option in the overall shoreline management strategy. Protection in conjunction with accommodation strategies may provide individual solutions to support economic viability.

³⁴ These mitigation strategies are offered for initial discussion, review and analysis by the stakeholders of Palm Beach County.

Environmental Vulnerability and Redevelopment Strategies

Palm Beach County's economic prosperity, like most coastal communities, depends largely on access to the coastal waterfront, the associated natural habitats, and access to the water-dependent uses. Although there generally will be no total loss of beaches due to sea level rise only, the increased storm surge and wave action that will occur, in addition to the rise in sea level, will result in an increased threat to beach access areas and beach erosion.

It should be noted that there were data limitations in this study with regard to beaches. Due to the dynamic nature of the beach and dune system, extents and area estimates measured from aerial photography can vary substantially between data sets^{35, 36}. Therefore, differences in map geometries cannot be computed (i.e., one layer cannot be subtracted from another). Instead, the width of the inundation zone was measured at twenty (20) random locations along the Palm Beach County shoreline and the proportion of the beach covered by the inundation zone was estimated.

Beach and Dune Erosion

Beach and dune erosion is the most immediate and visible impact of sea level rise. Hurricanes and other tropical storms can temporarily raise the sea 5 to 10 feet. A higher sea level brings higher inland flood inundation and erodes the beaches and dunes. The challenge lies in understanding how the multitude of factors affecting beach erosion will ultimately impact the length, width, and quality of the beaches and dunes. Palm Beach County continually engages in beach renourishment and dune restoration initiatives to maintain its pristine and economically valuable white sand beaches. Map 9: Beach Access Locations and Critical Erosion Areas in Appendix A, illustrates the beaches which are currently identified within the Capital Improvements Plan for shore protection and dune restoration initiatives. This project also attempted to provide a better understanding of how sea level rise and the increased impacts from hurricanes will affect these coastal resources. Initial estimates state that sea level rise could inundate approximately a third of the existing beaches. When hurricane storm surge of a Category 5 storm is added to this sea level rise inundation, then most of the beaches would be inundated. The challenge remains in better understanding when these beaches are no longer viable for recreational use and begin to endanger manmade structures along the waterfront. Narrowing beaches could enable storm waves to reach oceanfront buildings, roads, and boardwalks. The Federal Emergency Management Agency estimates that a one (1) foot rise in the sea level would increase flood insurance premiums by 35 to 60 percent. Map 9: Beach Access Locations and Critical Erosion Areas, also identifies the beach access locations which would be impacted by sea rise.

³⁵ * SFWMD Land Cover 2004-2005

³⁶ ** FDEP coastline 2011

Table 11: Beach Access Affected by Inundation

Inundation Zone	Number of beach access locations affected	Approximate beach area covered	Approximate beach width covered
3 foot SLR + Category 1 Surge	1	60%	85-140 ft
3 foot SLR + Category 3 Surge	13	80%	115-205 ft
3 foot SLR + Category 5 Surge	66	100%	100%

Sensitive Coastal Habitats

In addition to the loss of beaches and dunes, rising seas will affect a myriad of sensitive coastal habitats and may endanger sensitive species that live and breed in these areas. Initial analysis for Palm Beach County indicates that at a three foot sea level rise alone may be catastrophic to over eighty (80) percent of the saltwater marshes and mangrove swamps within the County. Both of these habitats are considered to be rare. Further complicating the issue in Palm Beach County is the fact that most of these lands are not buffered by adjacent natural lands. In the case of saltwater marshes, there is no natural land where these marshes might be permitted to migrate further westward. The vast majority of saltwater marshes in Palm Beach County abut developed land. If inland areas are undeveloped and are home to species of conservation concern, but at the same time, are not protected through conservation reservation measures, the result may be human disruption of native species and rare habitats. Saltwater intrusion into native freshwater wetland habitats can create a confluence of disturbances that can signal the end of freshwater dependent species. The loss of freshwater habitats, even if replaced with native saltwater habitats, can alter the landscape of the county, similarly to what has been found in the Keys with the replacement of pine rock land which was replaced with buttonwood shrub land in some areas. Very small changes in elevation impact habitat, soils, and salinity. Like other topic areas discussed in this report, areas impacted by sea level rise do not simply include areas affected by a three (3) foot rise. New areas of hurricane inundation may occur that did not previously exist, thus resulting in saltwater exposure to habitats that are intolerant to saltwater. This storm surge can create an influx of marl that results in a change in soil composition. The increases in salinity may have a direct impact on the rooting zones of plants. An example of this may be the native cabbage palm found along the Loxahatchee River. Cabbage palms that were found further east in the Loxahatchee River have begun to die off due to the increased salinity. As one moves farther west where salt and brackish water have been moving farther inland, the growth habits of these trees has also changed. They have become taller, more slender and appear to have stunted palm frond growth (i.e. the heads of the palm trees have become smaller).

Other examples of this have been observed in the major current changes in vegetation in the Everglades, which are related to sea level rise. They show that substantial

changes, including loss of coastal hardwood hammocks and buttonwood forests, will occur long before inundation. The rising water table that accompanies sea level rise leads to shrinking of the soil vadose zone and increases salinity in the bottom portion of the freshwater lens, subjecting plants to saltwater stress and physiological drought. The constraining effect of salinity on transpiration limits the distribution of freshwater-dependent communities. Sea level rise can result in the reduction of freshwater flow, compartmentalization of the wetlands, and affect the distribution of vegetation.³⁷

Tables 12, 13 and 14 contain data for the rare habitats which are at risk of being impacted by sea level rise, which include freshwater habitats or species that may be threatened by sea level rise. They are wetland coniferous forests, cypress, pine, cabbage palm, upland hardwood forests. Several freshwater-dependent species may also be threatened and include *Asclepias curtisii* (Curtiss' Milkweed), *Asimina tetramera* (four petal paw-paw), *Encyclia tampensis* (butterfly orchid), and the *Okenia hypogaea* (burrowing four o'clock).

Environmental impacts do not just relate to extinction or displacement of habitats. Sea level rise can impact ecosystems and have an effect on the appearance of our natural landscapes. For example, certain species of fish, such as snook, which inhabit warm, shallow coastal waters and are able to tolerate fresh and saltwater. They are most common along continental shores, preferring fast moving tides, and relying on shelter of estuaries, lagoons, mangrove areas, and brackish waters, but can only breed in saltwater. Although it appears that this may not be detrimental to the snook population, the more important issue is that there are delicate balances that may be impacted, which are not necessarily captured in the data in the tables below. While the data in the following tables is significant, it is also important to note that there are other environmental impacts that change the delicate balance of ecosystems that may not be captured in this data, such as the fish and vegetative habitats described here. Local, historical knowledge may provide an equally important resource of information in planning the best adaptation strategies for protecting the natural resources.

Habitat Restoration: Palm Beach County has actively been engaged in environmental restoration projects including the restoration of Munyon Island, Snook Island, and Ibis Isle. Each of these projects represents a successful effort to counter the impacts of human caused harm including dredging waterways, dumping sand, and invasive species. Through the removal of invasive exotic plant species and the planting of native plants, including mangroves and cord grass, the coastal or maritime hammock habitats have been restored. Maritime hammocks are



³⁷ Noss, Reed. "Between the devil and the deep blue sea: Florida's unenviable position with respect to sea level rise." Climatic Change. Published online June 2, 2011.

forested areas of higher elevation filled mostly with hardwood trees. These trees are adapted to living near the coast and are unique to South Florida. Sea grape and gumbo limbo are just two of many hardwood tree species planted. In some areas sand on the island was removed to lower the island's elevation, allowing the land to become intertidal. Intertidal areas are underwater at high tide and exposed to the air at low tide. It remains to be determined if similar projects such as these may be successful to mitigate the impacts of sea level rise within the vulnerable coastal habitat. As sensitive habitats are lost in one area, conditions may be suitable to actively support the creation of similar sensitive habitats in alternate locations.

Adaptation Strategies

All official adaptation action recommendations will be guided by the recommendations forthcoming from the Southeast Florida Regional Climate Change Compact

Retreat: The post-disaster environment may provide opportunities to implement policies, such as rolling easements that can reclaim previously developed areas and change their land use, so that they are in line with natural resource protection and preservation. These areas may be pre-identified so that they can be more easily implemented in the post-disaster environment. Local jurisdictions may also consider assessing existing and future publicly owned parks and recreational facilities that are located within the vulnerable areas in order to accommodate appropriate uses or to support retreat adaptation strategies. There may be funding opportunities to support the acquisition, enhancement, or expansion of these publicly owned lands or facilities in order to provide green space or designate passive recreation uses.



Accommodation: There may be areas in which retreat is not necessarily required. Incorporating land uses and design elements may allow for continued use, but still allow for species to exist or flourish. Although not related to sea level rise, an example of habitat accommodation would be the “Key Deer Overpasses” found in Monroe County. Since retreat (moving US 1) was not an option, portions of the roadway known to be inhabited by Key Deer were elevated and fences constructed to allow the deer to pass under the roadway between habitats, and the fences protected them from traffic hazards.

Protection: Since protection relies entirely on structural defense measures that prevent loss of land, human life, property, and resources, it may or may not be financially or environmentally sustainable in the post-disaster environment. Hard structural measures, including shoreline protection structures such as dikes, levees, seawalls, and floodgates, may not be feasible and may be avoided. Protective

measures may be limited to beach grass and dune restoration, beach renourishment, and secondary mangrove forest re-growth. Sustainable low energy shorelines might also be feasible.

Table 12: Summary of Rare Impacted Habitats										
Habitat Description	Countywide (2004-5)		SLR + Cat 1		SLR + Cat 3		SLR + Cat 5		Buffered by Adjacent Natural Lands	
	Acres	Rarity Rank	Acres	% Total	Acres	% Total	Acres	% Total	Acres	% Total
Saltwater Marshes	28.14	2	27.79	99%	27.79	99%	27.84	99%	0.00	0.0%
Mangrove Swamp	541.48	8	482.80	89%	505.40	93%	522.68	97%	45.33	10.3%
Swimming Beach	719.67	10	296.62	41%	557.74	77%	654.93	91%	0.00	0.0%
Coastal Shrub	412.99	7	78.36	19%	257.07	62%	335.07	81%	23.63	87.7%
Upland Hardwood Forests	639.65	9	112.09	18%	140.20	22%	186.95	29%	56.72	80.8%
Sand Pine	789.58	11	32.74	4.1%	93.37	12%	168.35	21%	16.90	100.0%
Table 13: Summary of Impacted Habitats										
Habitat Description	Countywide	(2004-5)	SLR + Cat 1		SLR + Cat 3		SLR + Cat 5		Buffered by Adjacent Natural Lands	
	Acres	Rarity Rank	Acres	% Total	Acres	% Total	Acres	% Total	Acres	% Total
Beach	719.67	1	296.62	41%	557.74	77%	654.93	91%	0.00	0%
Range land	9,177.89	2	125.31	1.4%	413.23	4.5%	600.79	6.5%	32.88	70.0%
Wetlands	49,321.69	3	377.76	0.8%	682.69	1.4%	1,102.70	2.2%	172.30	72.7%
Upland Forest	378,830.45	4	700.74	0.2%	874.43	0.2%	1,043.69	0.3%	177.64	29.2%

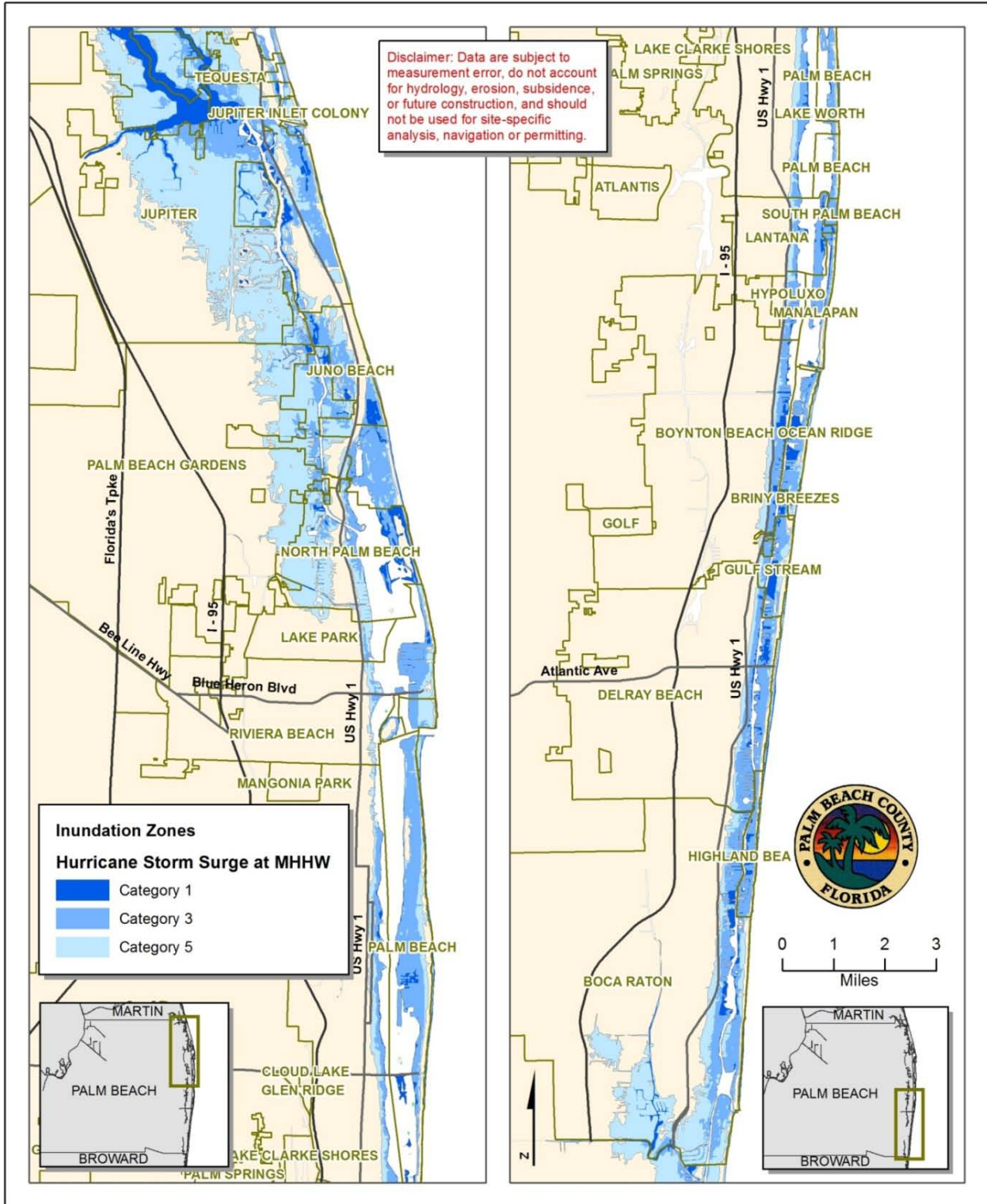
Table 14: Summary of Impacted Monitored Species within Preserves

Type	Species Name	Countywide Number	SLR + Cat 1 Number	% Total	SLR + Cat 3 Number	% Total	SLR + Cat 5 Number	% Total
	Aphelocoma coerulescen/Fl.						23	66%
Animal	Scrub Jay	35	3	9%	9	26%		
	Asclepias curtisii /						3	13%
Plant	Milkweed	24	0	0%	1	4%		
	Asmina tetramera /						359	99%
Plant	Four-petal Pawpaw	362	14	4%	185	51%		
	Cladonia perforata /						3	75%
Plant	Lichen	4	0	0%	2	50%		
	Encyclia tampensis /						11	100%
Plant	Fl. Butterfly Orchid	11	1	9%	10	91%		
	Lechea sp. / Saba						5	50%
Plant	Pinweed	10	1	10%	2	20%		
	Okenia hypogaea /						13	87%
Plant	Dune-groundnut	15	0	0%	6	40%		
	Ophioglossum					0%	1	100%
Plant	palmatum / Fern	1	0	0%	0			
	Opuntia stricta /						1	100%
Plant	Cactus	1	0	0%	1	100%		
	Osmunda regalis /						1	25%
Plant	Royal Fern	4	0	0%	1	25%		
	Tillandsia sp. /						13	22%
Plant	Tillandsia	60	2	3%	10	17%		

Health and Social Services Vulnerability and Redevelopment Strategies

Environmental Health: Even moderate increases in sea level could exacerbate storm surge inundation in the aftermath of a hurricane and stormwater runoff capability after prolonged rain events. Flooding, both permanent and intermittent, may allow diseases such as cholera and malaria to extend their ranges farther inland. Areas that continue to rely primarily upon private residential septic systems are also highly vulnerable to long-term standing water, and rising groundwater. These conditions in the aftermath of a disaster can pose a significant hazard to children who are exposed to sewage within the floodwaters. Vulnerable areas may be identified and monitored to anticipate escalating vulnerabilities over time.

Vulnerable populations: Sea level rise impacts are not likely to occur rapidly, but instead create a gradual long-term condition threat to a multitude of community elements. The lower socioeconomic populations in the United States are often disproportionately impacted by disasters and often have less personal resources to assist with recovery in the aftermath.



Palm Beach County Municipalities
 Hurrican Storm Surge Inundation Zones without Sea Level Rise

Sea Level Rise Hazard Vulnerability Analysis

Volume 2 Appendix 2

About the National Disaster Recovery Framework

Recovery begins with pre-disaster preparedness and includes a wide range of planning activities. The NDRF clarifies the roles and responsibilities for stakeholders in recovery, both pre- and post-disaster. It recognizes that recovery is a continuum and that there is opportunity within recovery. It also recognizes that when a disaster occurs, it impacts some segments of the population more than others.

The ability of a community to accelerate the recovery process begins with its efforts in pre-disaster preparedness, mitigation and recovery capacity building. These efforts result in a resilient community with an improved ability to withstand, respond to and recover from disasters. Timely decisions in response to disaster impacts can significantly reduce recovery time and cost.

The NDRF advances the concept that recovery encompasses more than the restoration of a community's physical structures to its pre-disaster conditions. Of equal importance is providing a continuum of care to meet the needs of the affected community members who have experienced the hardships of financial, emotional or physical impacts as well as positioning the community to meet the needs of the future. The NDRF also highlights the importance of disaster recovery activities that promote sustainability practices. These practices may reduce community vulnerability to recurrent disasters. Meeting these various needs — through strengthening the health and human services, social fabric, educational system, environmental sustainability, cultural resources and economic vitality — serves to enhance the overall resiliency of the entire community as the recovery progresses.

The National Disaster Recovery Framework (NDRF):

- A guide to promote effective recovery — it is a concept of operations and not intended to impose new, additional or unfunded net resource requirements
- Is intended to forge a common understanding of roles, responsibilities and resources available for effective recovery
- Describes the concepts and principles that promote effective Federal recovery assistance
- Identifies scalable, flexible and adaptable coordinating structures to align key roles and responsibilities
- Links local, State, and Federal governments, the private sector and nongovernmental and community organizations that play vital roles in recovery
- Captures resources, capabilities and best practices for recovering from a disaster and involves substantial risks and needs. Therefore, it will be extremely helpful to the success of a Federal Disaster Recovery Coordinator to have pre-established relationships with persons at the Federal, State and local levels, including the private

and nonprofit sectors. In large-scale and catastrophic incidents where a Federal role may be necessary, the Federal Disaster Recovery Coordinators have the knowledge, connections, and relationships to immediately begin effective disaster recovery coordination.

Post-Disaster Federal Disaster Recovery Coordinator Responsibilities

In large-scale disasters and catastrophic incidents when it may be necessary to deploy an FDRC in partnership with the State the FDRC's post-disaster, responsibilities may include:

- Develop a strategic approach for coordinating Federal assistance and policies. The intent is to facilitate timely, sufficient and effective Federal assistance to the impacted State or Tribal government to support its disaster recovery.
- Work with the impacted community to establish relevant recovery measures. The aim is to track overall recovery progress and support the community in meeting its recovery goals in terms of outcome, milestones and budget; to make timely adjustments to the recovery effort if needed; and to define relationships between new players and the existing framework.
- Promote inclusiveness in recovery. The intent is to increase participation of stakeholders to ensure innovations and solutions that support recovery are considered. The community should provide a forum to engage disaster-impacted individuals, particularly individuals with disabilities, individuals with limited English proficiency, seniors, members of underserved populations and advocates for children so that their needs and contributions are an integral part of the recovery process and outcome.
- Facilitate the development of a unified communications strategy. The objective is to have all stakeholders work in concert to manage expectations and to communicate a clear, consistent message to the public and ensure an accessible, comprehensive and culturally and linguistically appropriate communications outreach strategy.
- Coordinate Federal assistance to support community recovery planning. The goal is to supplement local capacity with needed expertise to conduct a successful planning process that results in a recovery plan that is publicly supported, actionable and leverages available resources.
- Work with the impacted community to incorporate mitigation and resilience-building measures into recovery plans and implementation. The goal is to minimize the community's risk to all hazards and make the recovered community safer, stronger, sustainable and more resilient from any man-made or natural hazards.
- Coordinate the Recovery Support Function (RSF) operations and activities. The FDRC consults with the RSF field coordinators to conduct a recovery impact assessment and recommend activation of the appropriate RSFs. The objective is to focus Federal resources on the most pertinent recovery needs and to promote partnerships between the Federal Government and stakeholders at the local, State and Tribal levels.

- Facilitate Federal funding streams and solutions to assistance gaps and overlaps. The intent is to maximize the benefit from Federal funds that an impacted community is qualified to receive, help prevent recovery delays, resolve rule and regulatory conflicts to the extent possible and help eliminate possible duplication of assistance in coordination with local, State and Tribal recovery coordinators.
- Reinforce the importance of compliance with Federal civil rights laws when using Federal funds. Federal funding carries with it the responsibility to comply with anti-discrimination laws. Federally-funded programs and activities should not intentionally or unintentionally exclude groups of people as a result of race, color, national origin, limited English proficiency, religion, sex, age or disability.

Overview

The National Disaster Recovery Framework

The National Disaster Recovery Framework (NDRF) is a conceptual guide designed to ensure coordination and recovery planning at all levels of government before a disaster, and defines how we will work together, following a disaster, to best meet the needs of states, local and tribal governments and communities and individuals in their recoveries. For the first time, the framework establishes coordination structures, defines leadership roles and responsibilities, and guides coordination and recovery planning at all levels of government before a disaster happens. It involves better utilization of existing resources.

Recovery Support Functions

The National Disaster Recovery Framework introduces six recovery support functions that are led by designated federal coordinating agencies. The Recovery Support Functions (RSFs) comprise the coordinating structure for key functional areas of assistance. Their purpose is to support local governments by facilitating problem solving, improving access to resources and fostering coordination among state and federal agencies, nongovernmental partners and stakeholders. The Recovery Support Functions and designated federal coordinating agencies are:

Community Planning and Capacity Building:	Federal Emergency Management Agency
Economic:	U.S. Department of Commerce
Health and Social Services:	U.S. Department of Health and Human Services
Housing:	U.S. Department of Housing and Urban Development
Infrastructure Systems:	U.S. Army Corps of Engineers
Natural and Cultural Resources:	U.S. Department of Interior

Leading Recovery

The framework identifies and recommends key recovery positions designed to allow for more concentrated focus on community recovery. These positions include a Federal Disaster Recovery Coordinator (when warranted in large-scale or catastrophic disasters), State/Tribal Disaster Recovery Coordinators and Local Disaster Recovery Managers.

Addressing the Needs of the Whole Community

The framework incorporates whole community values, with emphasis on core principles, such as individual and family empowerment and partnership and inclusiveness. The National Disaster Recovery Framework outlines how important state, local and tribal leadership and participation of community members in decision-making and coordinated engagement of a wide array of supporting organizations is critical for successful recovery.

Stakeholder Review and Comment

The framework was developed in partnership, and through extensive outreach, with Federal, state, local and tribal governments, private and non-profit partners who have a stake in immediate and ongoing recovery following a disaster. Outreach sessions that began in fall 2009 resulted in thousands of comments and recommendations from more than 600 stakeholders representing Federal, Tribal, state and local governments, public and private organizations, including communities recovering from disasters. This feedback informed the development of the draft National Disaster Recovery Framework.

In January 2010, the draft National Disaster Recovery Framework was published in the Federal Register for public comment. FEMA reviewed the more than 2,000 comments to further refine the final version of the National Disaster Recovery Framework.

Summary

This framework, which helps to better define how we, as a Nation, will approach recovery, is not a finish line, but just one part of our ongoing mission to better meet the needs of disaster survivors. We will continue to work with all of our stakeholders on ways to improve our programs, and better partner with the entire team, in our common goal to support communities as they recover.

FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

FEMA: Last Modified: 22-Sep-2011

National Disaster Recovery Framework (NDRF) Description

The recently released NDRF defines how the nation will work together to best meet the disaster recovery needs of individuals, families, communities and states. The NDRF is based on the principle that all emergency management partners, including the private sector, non-profit organizations, faith-based organizations, individual citizens, as well as local, state, tribal and federal government agencies have a role to play in the recovery process. And in catastrophic scenarios, leveraging resources of the whole community to meet the needs of disaster impacted communities is essential.

The National Disaster Recovery Framework is a guide that enables effective recovery support to disaster-impacted States, Tribes, Territorial and local jurisdictions. It provides a flexible structure that enables disaster recovery managers to operate in a unified and collaborative manner. It also focuses on how best to restore, redevelop and revitalize the health, social, economic, natural and environmental fabric of the community and build a more resilient Nation.

The National Disaster Recovery Framework is consistent with the vision set forth in the Presidential Policy Directive (PPD)-8, National Preparedness, which directs FEMA to work with interagency partners to publish a recovery framework. It is the first framework published under the Presidential Policy Directive reflecting the core recovery capabilities by supporting operational plans as an integral element of a National Preparedness System. It is a first step toward the PPD-8 objective to achieve a shared understanding and a common, integrated perspective across all mission areas—Prevention, Protection, Mitigation, Response, and Recovery—in order to achieve unity of effort and make the most effective use of the Nation's limited resources.

For the first time, the National Disaster Recovery Framework defines:

- core recovery *principles*,
- *roles* and *responsibilities* of recovery coordinators and other stakeholders,
- a *coordinating structure* that facilitates communication and collaboration among all stakeholders, guidance for pre- and post-disaster recovery *planning* and;
- the overall process by which communities can capitalize on opportunities to rebuild stronger, smarter and safer.

The National Disaster Recovery Framework introduces six new Recovery Support Functions that provide a structure to facilitate problem solving, improve access to resources, and foster coordination among State and Federal agencies, nongovernmental partners and stakeholders. Each Recovery Support Function has coordinating and primary Federal agencies and supporting organizations that operate together with local, State and Tribal government officials, nongovernmental organizations (NGOs) and private sector partners. The National Disaster Recovery Framework also presents three positions that provide focal points for incorporating recovery considerations into the decision making process and monitoring the need for adjustments in assistance where necessary and feasible throughout the recovery process. Those positions are Federal Disaster Recovery Coordinator (FDRC), State Disaster Recovery Coordinators (SDRC or TDRC) and Local Disaster Recovery Managers (LDRM).

Local Disaster Recovery Manager Responsibilities

National Disaster Recovery Framework

Successful recovery depends on all recovery stakeholders having a clear understanding of pre- and post-disaster roles and responsibilities. In keeping with the *National Disaster Recovery Framework (NDRF)* principles, clearly defined roles and responsibilities are a foundation for unity of effort among all recovery partners to jointly identify opportunities, foster partnerships and optimize resources.

The local government has the primary role of planning and managing all aspects of the community's recovery. Individuals, families and businesses look to local governments to articulate their recovery needs. Those plans should include a *Continuity of Government (COG)* and *Continuity of Operations (COOP) Plan*. Local government may become overwhelmed and need staffing, recovery expertise, leadership or other assistance. State and Federal officials work with local governments in the development and implementation of their plans and recovery efforts when needed and requested.

Achieving Disaster Recovery describes the components of a successful disaster recovery management system for all levels of government decision making. Coordination, integration, community engagement and management are prominent system elements in keeping with the *National Disaster Recovery Framework (NDRF)* Core Principles of Leadership.

The National Disaster Recovery Framework presents and strongly recommends that State governors as well as local government leaders prepare as part of their disaster recovery plans to appoint Local Disaster Recovery Managers (LDRMs) to lead disaster recovery activities for the jurisdiction.

The role of the Local Disaster Recovery Managers is to organize, coordinate and advance the recovery at the local level. The experience and skill sets of these individuals should include a strong basis in community development and good knowledge of the community's demographics. While these positions will often interact with the emergency management community, it is not necessary that these individuals be emergency management professionals.

Their primary role is to manage and coordinate the redevelopment and building of community. In addition, the individuals occupying the positions should be able to represent and speak on behalf of their respective chief executives (e.g., mayor). The Local Disaster Recovery Managers serve as the jurisdiction's primary point of contact with the State Disaster Recovery Coordinator.

Pre-Disaster Responsibilities

- Serve as primary point of contact (POC) for disaster recovery preparedness with the State and neighboring local and Tribal governments.
- Coordinate development, training and exercise of PDRP
- Establish and maintain contacts and networks for disaster recovery resources and support systems.
- Promulgate principles and practices that further resiliency and sustainability in development and strategic planning initiatives.

Post-Disaster Responsibilities

- Lead the creation and coordinate the activities of local recovery-dedicated organizations and initiatives.
- Work with the SDRC to develop a unified and accessible communication strategy.
- Participate in damage and impact assessments with other recovery partners.
- Organize recovery planning processes, which includes individuals with disabilities and others with access issues, seniors and members of underserved communities, to fully engage constituents' input; lead the development of the community's or Tribe's recovery visions, priorities, resources, capability and capacity.
- Ensure inclusiveness in the community recovery process, including persons with disabilities and limited English proficiency.
- Communicate recovery priorities to State and Federal governments and other recovery stakeholders and supporters.
- Incorporate critical mitigation, resilience, sustainability and accessibility-building measures into the recovery plans and efforts.
- Lead the development of the community's recovery plans and ensure that they are publicly supported, actionable and feasible based on available funding and capacity.
- Collaborate with State, Federal and other stakeholders and supporters, such as the business and nonprofit communities, to raise financial support (including long-term capital investment in local businesses) for the community's recovery, leverage the resources where possible and resolve potential duplication of assistance.
- Work closely with the recovery leadership at all levels to ensure a well-coordinated, timely and well-executed recovery.
- Develop and implement recovery progress measures and communicate adjustments and improvements to applicable stakeholders and authorities.

State Disaster Recovery Manager Responsibilities

National Disaster Recovery Framework

States lead, manage and drive the overall recovery process and play the central role in coordinating recovery activities that include providing financial and technical support. States oversee regional coordination of recovery, set priorities and direct assistance where it is needed.

States are a conduit to local and Tribal governments for key Federal recovery assistance programs. In addition to managing Federally-provided resources, State government may develop programs or secure funding that can help finance and implement recovery projects. An example of this type of assistance is helping communities acquire appropriate insurance coverage pre-disaster or issuing bonds after a disaster. Where additional needs exist, States can reassign existing internal resources to streamline and expedite recovery, such as forming a new or ad hoc State recovery agency. States play an important role in keeping the public informed through strategic messaging and working with all other stakeholders to provide an information distribution process. State government agencies are also employers and need their own disaster recovery plan, such as *Continuity of Governments (COG)* and *Continuity of Operations (COOP)*, to protect and assist their employees.

Pre-Disaster Responsibilities

- Serve as primary POC for disaster recovery preparedness with local, Tribal and Federal governments, particularly the Federal Disaster Recovery Coordinator (FDRC).
- Coordinate development, training and exercise of state disaster recovery plan
- Establish and maintain contacts and networks for disaster recovery resources and support systems.
- Promulgate principles and practices that further resiliency and sustainability in development and strategic planning initiatives.

Post-Disaster Responsibilities

- Establish and/or lead a statewide structure for managing recovery. Provide support for local and/or Tribal recovery-dedicated organizations initiatives.
- Communicate the roles and responsibilities of the State to the local and Tribal governments.
- Work with recovery coordinators and leads at the Federal and other levels to facilitate the development of a unified and accessible communication strategy.
- Support recovery planning processes, which includes individuals with disabilities and others with access issues, seniors and members of underserved communities, to fully engage constituents' input and result in development of the community's or Tribe's recovery visions, priorities, resources, capability and capacity.
- Ensure inclusiveness in the community recovery process, including persons with disabilities and limited English proficiency.

- Facilitate communication of recovery priorities for all impacted communities. Communicate statewide recovery priorities to the FDRC.
- Encourage incorporation of critical mitigation, resilience, sustainability and accessibility-building measures into the recovery plans and efforts.
- Coordinate State, Tribal, Federal and other funding streams for recovery efforts and communicate issues and solutions to recovery assistance gaps and overlaps.
- Collaborate with Federal and other stakeholders and supporters, such as the business and nonprofit communities, to raise financial support (including long-term capital investment in local businesses) for the community's or Tribe's recovery, leverage the resources where possible and resolve potential duplication of assistance.
- Work closely with the recovery leadership at all levels to ensure a well-coordinated, timely and well-executed recovery.
- Develop and implement recovery progress measures and communicate adjustments and improvements to applicable stakeholders and authorities.

Federal Disaster Recovery Coordinator Responsibilities

National Disaster Recovery Framework

While disaster-impacted jurisdictions must necessarily and immediately focus on emergency response activities, the decisions made very early after a disaster influence recovery. In large-scale disasters and catastrophic incidents where a Federal role may be necessary, the Federal Disaster Recovery Coordinator (FDRC) is a focal point for incorporating recovery and mitigation considerations into the early decision making processes. The Federal Disaster Recovery Coordinator monitors the impacts and results of such decisions and evaluates the need for additional assistance and adjustments where necessary and feasible throughout the recovery.

In these situations, the Federal Disaster Recovery Coordinator works as a deputy to the Federal Coordinating Officer (FCO) for all matters concerning disaster recovery. The Federal Disaster Recovery Coordinator is responsible for facilitating disaster recovery coordination and collaboration between the Federal, Tribal, State and local governments, the private sector and voluntary, faith-based and community organizations. The Federal Disaster Recovery Coordinator partners with and supports the Local Disaster Recovery Manager (LDRM) and the State and/or Tribal Disaster Recovery Coordinator (SDRC/TDRC) to facilitate disaster recovery in the impacted State or Tribal area.

Federal Disaster Recovery Coordinator Authority

Nothing in the National Disaster Recovery Framework alters or impedes the ability of local, State, Tribal or Federal departments and agencies to carry out their specific authorities or perform their responsibilities under all applicable laws, Executive Orders and directives. Federal Disaster Recovery Coordinator authority to facilitate disaster recovery coordination and collaboration is derived from the appropriate disaster recovery authority that may apply to the incident.

Other Federal departments and agencies carry out their disaster recovery authorities and responsibilities within the overarching construct of the National Disaster Recovery Framework. Additionally, nothing in the National Disaster Recovery Framework is intended to impact or impede the ability of any Federal department or agency to take an issue of concern directly to the President or any member of the President's staff.

For a large-scale disaster or catastrophic incident declared under the *Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act)*, the Federal Disaster Recovery Coordinator works as a deputy to the FCO for all matters concerning disaster recovery.

Pre-Disaster Responsibilities

The responsibilities of the Federal Disaster Recovery Coordinator require an understanding of pre-disaster recovery planning as well as post-disaster recovery leadership and coordination. Since each community is unique in terms of its size, population and challenges, the development of effective recovery efforts will need to be crafted to fit each individual region's risks and needs. Therefore, it will be extremely helpful to the success of a Federal Disaster Recovery Coordinator to have pre-established relationships with persons at the Federal, State and local levels, including the private and nonprofit sectors. In large-scale and catastrophic incidents where a Federal role may be necessary, the Federal Disaster Recovery Coordinators have the knowledge, connections, and relationships to immediately begin effective disaster recovery coordination.

Post-Disaster Responsibilities

In large-scale disasters and catastrophic incidents when it may be necessary to deploy an FDRC in partnership with the State the FDRC's post-disaster responsibilities may include:

- Develop a strategic approach for coordinating Federal assistance and policies. The intent is to facilitate timely, sufficient and effective Federal assistance to the impacted State or Tribal government to support its disaster recovery.
- Work with the impacted community to establish relevant recovery measures. The aim is to track overall recovery progress and support the community in meeting its recovery goals in terms of outcome, milestones and budget; to make timely adjustments to the recovery effort if needed; and to define relationships between new players and the existing framework.
- Promote inclusiveness in recovery. The intent is to increase participation of stakeholders to ensure innovations and solutions that support recovery are considered. The community should provide a forum to engage disaster-impacted individuals, particularly individuals with disabilities, individuals with limited English proficiency, seniors, members of underserved populations and advocates for children so that their needs and contributions are an integral part of the recovery process and outcome.
- Facilitate the development of a unified communications strategy. The objective is to have all stakeholders work in concert to manage expectations and to communicate a clear, consistent message to the public and ensure an accessible, comprehensive and culturally and linguistically appropriate communications outreach strategy.
- Coordinate Federal assistance to support community recovery planning. The goal is to supplement local capacity with needed expertise to conduct a successful planning process that results in a recovery plan that is publicly supported, actionable and leverages available resources.
- Work with the impacted community to incorporate mitigation and resilience-building measures into recovery plans and implementation. The goal is to minimize the community's risk to all hazards and make the recovered community safer, stronger, sustainable and more resilient from any man-made or natural hazards.
- Coordinate the Recovery Support Function (RSF) operations and activities. The FDRC consults with the RSF field coordinators to conduct a recovery impact assessment and recommend activation of the appropriate RSFs. The objective is to focus Federal resources on the most pertinent recovery needs and to promote partnerships between the Federal Government and stakeholders at the local, State and Tribal levels.
- Facilitate Federal funding streams and solutions to assistance gaps and overlaps. The intent is to maximize the benefit from Federal funds that an impacted community is qualified to receive, help prevent recovery delays, resolve rule and regulatory conflicts to the extent possible and help eliminate possible duplication of assistance in coordination with local, State and Tribal recovery coordinators.

- Reinforce the importance of compliance with Federal civil rights laws when using Federal funds. Federal funding carries with it the responsibility to comply with anti-discrimination laws. Federally-funded programs and activities should not intentionally or unintentionally exclude groups of people as a result of race, color, national origin, limited English proficiency, religion, sex, age or disability.

Frequently Asked Questions about the National Disaster Recovery Framework

1. What is the National Disaster Recovery Framework?

The National Disaster Recovery Framework is a guide, designed to ensure coordination and recovery planning at all level of government before a disaster, and defines how we will work together, following a disaster, to best meet the needs of states and communities in their recoveries.

This guide is the product of efforts to meet requirements from two key directives: first, the Post-Katrina Emergency Management Reform Act of 2006 requires FEMA to develop a National Disaster Recovery Strategy. Additionally, Presidential Policy Directive (PPD)-8, National Preparedness directs FEMA to work with interagency partners to publish a *National Disaster Recovery Framework* and supporting operational plans as an integral element of a National Preparedness System.

2. What kind of outreach has been done to develop the National Disaster Recovery Framework?

The National Disaster Recovery Framework was developed in partnership, and through extensive outreach, with Federal, state, local, tribal, private and non-profit partners who have a stake in the immediate and ongoing recovery following a disaster.

Outreach sessions, that began in Fall 2009, by the Long-Term Disaster Recovery Working Group resulted in thousands of comments and recommendations from more than 600 stakeholders representing Federal, Tribal, State and local governments, public and private organizations, including communities recovering from disasters. This feedback informed the development of the draft National Disaster Recovery Framework. The draft National Disaster Recovery Framework was published in the Federal Register, in January 2010, for public comment. FEMA reviewed the more than 2,000 comments to further refine the final version of the National Disaster Recovery Framework.

3. What is new in the National Disaster Recovery Framework?

The National Disaster Recovery Framework, for the first time, defines how, as a nation, we will approach recovery. The National Disaster Recovery Framework establishes, for the first time, coordination structures, leadership roles and responsibilities, and guides recovery planning at all levels of government before a disaster happens.

The National Disaster Recovery Framework introduces recovery support functions that are led by designated federal coordinating agencies. These coordinating federal agencies support state, local, tribal and private sector groups with community planning and capacity building, regaining economic stability, rebuilding infrastructure, restoring health and social services, and natural and cultural resources and meeting the housing needs of residents displaced by disasters.

In addition, the National Disaster Recovery Framework recommends and identifies key recovery leadership positions designed to allow for more concentrated focus on community recovery. These include State/Tribal disaster recovery coordinators and local disaster recovery manager, as well as a Federal Disaster Recovery Coordinator when needed for large-scale or catastrophic disasters.

4. When and where will the National Disaster Recovery framework first be implemented?

FEMA has already begun field testing some of the concepts and constructs outlined in the National Disaster Recovery Framework in Alabama, Missouri and Tennessee. For example, in Alabama, the State aligned its coordination efforts with the Recovery Support Functions. FEMA and its partners followed suit, with the overarching Federal disaster recovery coordinator managing the overall recovery effort. In Tennessee, FEMA field tested the FDRC and the RSF concepts. In the JFO organizational structure the FDRC role was established as a Deputy FCO for Long- Term Community Recovery (DFCO/LTCR). Also, several federal agencies deployed staff to participate in the NDRF field test. Staff from six agencies was mission assigned to the disaster and organized under the ESF #14 Coordination Branch: U.S. Army Corps of Engineers, U.S. Departments of Agriculture, U.S. DOC/Economic Development Administration, U.S. Environmental Protection Agency, U.S. Department of Health and Human Services, and U.S. Department of Housing and Urban Development. The U.S. Small Business Administration (SBA) already deployed to the disaster for response activities, also participated in Recovery Support Function activities.

The effective implementation of the National Disaster Recovery Framework, whether or not in the context of a presidential disaster declaration, requires interagency cooperation and engagement across all levels of government and support from nongovernmental organizations and the private sector. FEMA and other federal agency partners will conduct various outreach efforts to make sure all stakeholders are briefed on the new concepts identified in the National Disaster Recovery Framework.

5. Has FEMA documented lessons learned and results from the field tests?

Yes. Based on this initial implementation of the Recovery Support Functions and leadership positions, it is clear that these National Disaster Recovery Framework concepts present an opportunity for increased collaboration and coordination of recovery resources.

Early indications show that states find it useful to align their organizational coordination structure closely to the Recovery Support Functions. In Alabama, the interagency coordination through the Recovery Support Functions has helped to leverage existing federal funds.

For instance, the recovery support function focusing on economic stability, led by the U.S. Department of Commerce working closely with state partners (the Tennessee Department of Economic and Community Development, the Tennessee Emergency Management Agency) identified a potential local economic impact when a major employer in the area was looking to move operations to another location outside the state due to the flood, and damaged incurred to their facility. Working together and collaborating with other partner agencies, the team was able to present a retention package to the employer, and secure 1,180 jobs in Ashland City and Cheatham County.

6. Why a Framework vs. Strategy?

FEMA believes that a Framework – a companion to the National Response Framework that outlines roles and responsibilities and a comprehensive organizing structure for disaster recovery better describes what Congress requested in PKEMRA.

Also, *Presidential Policy Directive (PPD)-8, National Preparedness* directs FEMA to work with interagency partners to publish a National Disaster Recovery Framework and supporting operational plans as an integral element of a National Preparedness System.

7. How will the National Disaster Recovery Framework change the way the Federal Government supports disaster recovery?

The National Disaster Recovery Framework establishes a clear structure for interagency and nongovernmental partners to align resources and work together to support recovery in a holistic, coordinated manner. The National Disaster Recovery Framework adds several new positions to the Joint Field Office structure for large-scale and catastrophic incidents, including the senior Federal Disaster Recovery Coordinator that will allow for more concentrated focus on community recovery. These new positions will have the flexibility to be assigned, when necessary, to some of the hardest hit areas as a result of large-scale or catastrophic disasters so that as a community and a team the federal government can ensure a speedy and seamless recovery process.

8. How does the National Disaster Recovery Framework incorporate the whole community in recovering from disasters?

The National Disaster Recovery Framework incorporates whole community values and emphasizes core principles that reflect the whole community objectives, such as individual and family empowerment and partnership and inclusiveness.

FEMA's Whole Community core values guide the federal approach to supporting disaster recovery, provide the basis for what the Agency does, and how FEMA personnel operate and interrelate with others.

9. How will FEMA ensure partners are familiarized and trained to implement National Disaster Recovery Framework?

This National Disaster Recovery Framework, which helps to better define how we as a nation will approach recovery, is not a finish line, but just one part of our ongoing mission to better meet the needs of disaster survivors. We will continue to work with all of our stakeholders on ways to improve our programs, and better partner with the entire team, in our common goal to support communities as they recover.

FEMA will also be conducting briefings overtime with key stakeholders and the public in each Region following the initial rollout of the NDRF.

10. How often will the National Disaster Recovery Framework be updated?

The National Disaster Recovery Framework is a living document that will continue to be updated to include annexes for each Recovery Support Function. We will continue to work with all of our stakeholders on ways to improve our common goal to support communities as they recover. Updates to the National Disaster Recovery Framework will be implemented to incorporate these improvements, as needed or every five years.

FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

FEMA: Last Modified: 22-Sep-2011

Post Disaster Redevelopment Plan
Volume 3

2012-2013 Edition



Note About Volume 3 Content Credits



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Volume 3 is intended to serve as a primary reference and decision support document for PDRP users. It makes no claim of being a totally original document. It contains a combination of original writings, excerpts from contracted research, and direct excerpts from other credited public access PDRP products, including Hillsborough County's PDRP and the State's Post-Disaster Redevelopment Planning: A Guide for Florida Communities, various federal and state governmental reports, and sea level rise reports prepared by the Southeast Florida Regional Climate Change Compact and Treasure Coast Regional Planning Council

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Quick Reference Guide to PDRP

Volume 1 PDRP Activation & Implementation

- What is the Post Disaster Redevelopment Plan?
- Where the PDRP Fits in Disaster Recovery
- Goals for Long Term Recovery
- PDRP Activation
 - Decision Triggers
 - Authority
 - Activation Process
 - Types & Levels of Disasters
 - Key Issue Areas
- PDRP Implementation
 - Organizational Concept & Members
 - Implementation through Working Groups
 - Roles & Responsibilities
 - Linkages with State and Federal Agencies
 - Overview National Disaster Recovery Framework Guidance
- Action Matrices (Pre and Post Disaster)

Volume 2 Technical / Decision Support Information

- The Hazard Environment (Natural, Social, Built, Economic, Environmental)
- Hazard Analysis/ Risk Assessments
- Special Section: “Sea Level Rise” Vulnerability Analysis & Adaptation Strategies Model
- Detailed Guidance on Key Recovery Issues
 - Governance Challenges during Long-Term Recovery
 - Sustaining Essential Governmental Services in Face of Economic Crisis
 - Infrastructure/Public Facilities Restoration
 - Land Use
 - Housing
 - Economic Redevelopment
 - Health & Social Services
 - Environmental Preservation/Restoration
 - Public Outreach
- Funding & Assistance Sources/Strategies
- Detailed National Disaster Recovery Framework Guidance
- Glossary of Referenced Terms
- Acronyms
- Maps

Volume 3 Administrative Support Information

- Plan Development
- Integration with Other Community Plans
- “Sea Level Rise” Plan Integration Model
- PDRP Feedback, Reviews and Critiques
- Plan Maintenance/Updating
- PDRP Rosters/Resources/Contacts
- Appendices

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Table of Contents

VOLUME 3 ADMINISTRATIVE SUPPORT INFORMATION.....	6
Summary of Plan Development/Updating Processes	6
1995 Post Disaster Redevelopment Plan.....	6
2006 Post Disaster Redevelopment Plan.....	7
2011-2013 PDRP Update	8
PDRP Adoption Documentation	9
CRITICAL REVIEWS OF THE 2006 PALM BEACH COUNTY PDRP.....	18
Government Accountability Office.....	19
Pre-Disaster Planning for Post-Disaster Recovery: Case Studies	20
FEMA – University of Oregon (2010).....	22
Planning for Coastal Resilience: Best Practices for Calamitous Times	23
Gap Analysis of 2006 PDRP by the Florida Department of Community Affairs	24
PDRP PLAN INTEGRATION ANALYSIS/SEA LEVEL RISE.....	42
Sea Level Rise Integration and Community Resilience.....	46
Section I: Review of Community Resilience Strategies in Existing Plans	47
Section II: Recommendations for Future Sea Level Rise Plan Integration	62
Local Mitigation Strategy Integration.....	79
PDRP MAINTENANCE/UPDATING	87
PDRP EXECUTIVE COMMITTEE & INVITEES.....	90
PDRP Working Group Chairs.....	91
RECORD OF REVISIONS	94
APPENDICES	95
Appendix 1 - Post Disaster Visioning and Community Participation Process Guide.....	95
Appendix 2 - PDRP Draft Ordinance	98

VOLUME 3 ADMINISTRATIVE SUPPORT INFORMATION

Summary of Plan Development/Updating Processes

Palm Beach County is among the most mature post disaster redevelopment programs in the state. Several editions of Palm Beach County's PDRP have been produced. Each edition attempts to enhance the plan's utility as an effective recovery and redevelopment tool. The following paragraphs briefly summarize the planning processes employed during major PDRP updates and enhancements.

More detailed discussions are included in each of the editions themselves.

1995 Post Disaster Redevelopment Plan

The catalyst for development of the County's first PDRP was the 1989 Comprehensive Plan which recognized the climatology of the region and its potential for damaging hurricanes and flood-related hazards. In accordance with State law, the Board of County Commissioners, adopted language in the Comprehensive Plan that addressed the need to develop a long-range redevelopment plan. In the summer of 1992, the Board directed County departments to develop a Long-Range Redevelopment Plan that would coordinate the activities of all County agencies in Palm Beach County.

With the assistance of an out-of-state consultant, a special ad hoc multidisciplinary Task Force was formed to develop a PDRP. The County's Building Division took the lead in coordinating development of the plan.

The resulting plan focused primarily on; post disaster organization and authority, land use, building reconstruction regulations and public sector services. Economic recovery was addressed in a very rudimentary manner. The plan was officially adopted as the county's PDRP by the Board of County Commissioners in October 1995.

Maintenance of the plan was initially assigned to the Building Division, but eventually gravitated to the Division of Emergency Management. While the plan underwent periodic minor revisions after its adoption, it remained largely the same in form, scope, and substance until 2005.

As the County's Comprehensive Emergency Management Plan and Local Mitigation Strategy program grew in size and sophistication, and lessons were learned from a number of large-scale disaster events around the country, it became apparent that the PDRP needed to be expanded, enhanced and brought in line with contemporary thinking, priorities, plans, and practices. It was also evident that the Plan needed to be more fully integrated with the County's growth management and disaster recovery and mitigation plans, programs and procedures.

2006 Post Disaster Redevelopment Plan

Funded by a State of Florida EMPA competitive grant, the County initiated a comprehensive project to develop a state-of-the-art PDRP. No model pre disaster plans for post disaster redevelopment could be found in the literature, so new ground needed to be broken.

The stated objective of the project was to:

Develop an updated/revised “multi-jurisdictional” Post Disaster Redevelopment Plan which incorporates best policies and practices relative to current and future community needs, meets or exceeds local, state and federal guidelines, and otherwise supports community plans and programs, including Comprehensive Plans, the unified Local Mitigation Strategy, Comprehensive Emergency Management plans, etc.

An expanded Post Disaster Redevelopment Executive Committee comprised of county and municipal officials and a cross section of community stakeholders was established to oversee the PDRP development process. Co-Chaired by the Deputy County Administrator and the Executive Director of the Palm Beach County League of Cities, the Executive Committee provided direction, technical expertise and reviewed successive drafts of the plan.

Technical aspects of the project and a good portion of the writing were done by the Senior Planner of the Division of Emergency Management, an area planning and mitigation consulting firm, and the Treasure Coast Regional Planning Council.

Plan development was a highly participative process. In addition to numerous one-on-one and group planning meetings a half day public forum was conducted to solicit citizen, NGO and business inputs and reactions to proposed plan content and emphasis. It was decided there was a need for additional, unbudgeted inputs from technical experts, business continuity professionals, urban planners, housing professionals, economists and emergency managers experienced in major disaster recovery efforts. Concurrent with the plan development process Katrina struck the Gulf, providing a useful, albeit unfortunate, living case study for issues that needed to be incorporated into the PDRP.

Using grant funds secured from the Public Entity Risk Institute, a comprehensive one day symposium/workshop was organized. The session featured distinguished speakers who were actively working in the Gulf during early Katrina recovery efforts and Daniel Alesch, a noted authority on community recovery following extreme events. Attendees included 178 invited government, business, NGO, and academic leaders, including regional, state and federal representatives. Five areas of special interest were addressed by breakout sessions. These included the following post disaster recovery topics:

- Balancing rebuilding quickly with rebuilding smart
- Sustaining governmental services in the face of economic crisis
- Business survival, recovery and retention
- Housing and repopulation
- Quality of life issues

The 2006 PDRP was specifically designed to serve the following purposes:

- Establish a sustainable, countywide, long-term, coordinated process to enhance the community's ability to withstand and rebound from a major disaster event and rebuild in a manner that promotes greater disaster resilience.
- Serve as a single source resource to support post disaster long-term recovery and redevelopment decisions and actions
- Identify issues and pre and post disaster issues that will need to be addressed; including recommendations in the form of user-friendly action matrices
- Ensure the recovery process exploits, meshes with, and builds upon existing pre and post disaster planning and operations policies, processes and capabilities.
- Apply best recovery and planning practices consistent with local, state and federal guidance.

The 2006 PDRP drew extensive attention and acclaim nationwide. The U.S. Government Accountability Office dispatched a Strategic Issues team to Palm Beach County to meet with the PDRP project team and select members of the Executive Committee. The plan was subsequently featured in a GAO report on best practices. The plan was also featured in numerous other government, business and academic reports on best recovery practices. The PDRP also served as a strawman model for several statewide initiatives to expand post disaster redevelopment planning, including development of a guideline document published by the Florida Department of Community Affairs and the Florida Division of Emergency Management and several pilot projects around the state. The Palm Beach County PDRP was also briefed to the White House by FEMA in 2009.

Despite this external recognition there was concern internally that the plan had not been fully institutionalized into the county's recovery process and needed to be made more actionable. Recognizing that a state guideline document was being prepared to reflect lessons learned and best planning practices, the county held off encouraging its 38 municipalities to adopt the 2006 plan by resolution pending a planned update of the plan.

2011-2013 PDRP Update

In 2011 work began on updating and further enhancing the PDRP. The PDRP project team requested a gap analysis by the Florida Department of Community Affairs evaluating the 2006 PDRP against the state Post Disaster Planning Guidebook. A copy

of the gap analysis report is included in this section. Results of the analysis were factored into the planning process.

It was estimated that the enhancement process would take about 18 months to complete. That timeline was accelerated to accommodate a request from DCA to integrate sea level rise adaptation strategies into the revised PDRP in a way that could serve as a model for other communities. As the deadline for that integration project was December 2011, the PDRP revision process was split into two phases. Phase 1 incorporated actions to reconfigure and rewrite sections to make the PDRP more user-friendly and actionable. Phase 2, to be accomplished in 2012 would complete this process and focus on implementing several pre-disaster initiatives called out in the plan.

The plan revision and enhancement process encouraged increased participation and buy-in on the part of the 38 municipalities through the League of Cities and City Managers Association, and more intensive technical and administrative involvement and collaboration through members of technical advisory work groups and partnering subject experts.

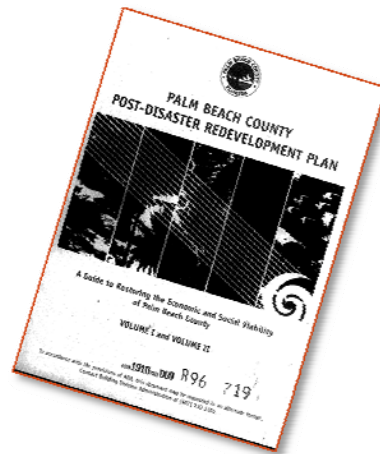
PDRP Adoption Documentation

1996 PDRP

BCC Agenda Item

BCC Resolution

Table of Contents



2006 PDRP

BCC Agenda Item

BCC Resolution

Table of Contents



Agenda Item #: 3.J. *1*
2002 A/MC
4-6
R.96-719

R96 719

1996 PDRP BCC Adoption Resolution (p1)

RESOLUTION NO. R-96-719

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF PALM BEACH COUNTY, FLORIDA, PROVIDING FOR ADOPTION OF THE PALM BEACH COUNTY POST-DISASTER REDEVELOPMENT PLAN AS GUIDE FOR EFFORTS TO RESTORE PALM BEACH COUNTY AFTER A MAJOR DISASTER; PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, there is a high probability of a major hurricane striking the Florida coastline; and

WHEREAS, it is the intent of the Board of County Commissioners to provide for the health, safety, and welfare of the community through sound pre and post planning; and

WHEREAS, the 1989 Palm Beach County Comprehensive Plan requires the County to prepare and implement a Post-Disaster Redevelopment Plan; and

WHEREAS, the Palm Beach County Post-Disaster Redevelopment Plan was prepared in accordance with the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the National Flood Insurance Act, Chapters 161, 163, 187, 380 and 553, Florida Statutes and Rules 9J-5 and 16B-33, Florida Administrative Code; and

WHEREAS, this plan contains the goals, objectives, policies and actions which promote a faster return to economic and social activity and reduce future loss of life and property; and

WHEREAS, this plan has been reviewed by the affected municipalities, and the Municipal League, the Countywide Intergovernmental Coordination Committee and several departments and agencies.

BOOK 1910 PAGE 002

R96 719

1996 PDRP BCC Adoption Resolution (pg 2)

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF PALM BEACH COUNTY, FLORIDA, THAT:

Section 1. Adoption

The Palm Beach County Post-Disaster Redevelopment Plan attached hereto as Exhibit A is hereby adopted as a set of guidelines to aid efforts to restore the County after a major disaster.

Section 2. Effective Date

This Resolution shall take effect upon adoption by the Board of County Commissioners.

The foregoing Resolution was offered by Commissioner AARONSON, who moved its adoption. The motion was seconded by Commissioner MCCARTY and, being put to a vote, the vote was as follows:

COMMISSIONER KEN L. FOSTER	AYE
COMMISSIONER BURT AARONSON	AYE
COMMISSIONER MAUDE FORD LEE	AYE
COMMISSIONER MARY MCCARTY	AYE
COMMISSIONER KAREN T. MARCUS	AYE
COMMISSIONER WARREN H. NEWELL	AYE
COMMISSIONER CAROL A. ROBERTS	AYE

The Chair thereupon declared the Resolution duly passed and adopted this 4th day of JUNE, 1996.

APPROVED AS TO FORM AND
LEGAL SUFFICIENCY

PALM BEACH COUNTY, FLORIDA, BY
ITS BOARD OF COUNTY COMMISSIONERS

By: [Signature]
County Attorney

By: [Signature]
Deputy Clerk



(g:\common\wpdata\landuse\rbanks\pd.res)

BOOK 1910 PAGE 003

R96 719

1996 PDRP Table of Contents

TABLE OF CONTENTS		PAGE
INTRODUCTION AND BACKGROUND		1-4
GUIDELINES ON HOW TO USE THE PLAN		5
ACRONYMS		6-7
DEFINITIONS		8
ABBREVIATIONS		9-10
CHAPTER I: RECONSTRUCTION PROGRAM		
A.	Authority	11-13
B.	Reconstruction Policies	13-17
C.	Tools, Forms and Procedures	17-39
CHAPTER II: PALM BEACH COUNTY GOVERNMENT ACTIVITIES		
A.	Introduction	40
B.	Public Facilities	40-41
C.	Vital Records	41
D.	Land Development Policies	41-42
CHAPTER III: MULTI-JURISDICTIONAL COORDINATION ITEMS		
A.	Introduction	43
B.	Housing and Shelters	43-44
C.	Economic	44-46
D.	Toxic Hazards	47
CHAPTER IV. EDUCATION AND TRAINING		
A.	Introduction	48
B.	Education	48-49
C.	Training	49-50
D.	Grants	50
APPENDIX:		51-71
A.	List of Approved Municipal Mutual Aid Agreements	52-53
B.	Statewide Mutual Aid Agreements for Catastrophic Disaster Response and Recovery	54-71

BOOK 1910 PAGE 012

R96 719 1

2006 PDRP BCC Agenda Item (p2)

II. FISCAL IMPACT ANALYSIS

A. Five Year Summary of Fiscal Impact

Fiscal Years	2007	2008	2009	2010	2011
Capital Expenditures					
Operating Costs					
External Revenues					
Program Income (County)					
In-Kind Match (County)					
NET FISCAL IMPACT	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
# ADDITIONAL FTE POSITIONS (Cumulative)	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>

Is Item Included In Current Budget? Yes ☐ No ☐

Budget Account No.: Fund _____ Agency _____ Org. _____ Object _____
Reporting Category

B. Recommended Sources of Funds/Summary of Fiscal Impact:

There is no fiscal impact.

C. Departmental Fiscal Review:

III. REVIEW COMMENTS

A. OFMB Fiscal and/or Contract Dev. and Control Comments:

Elizabeth Blase 11/15/06 N/A
OFMB 11/14/06 Contract Administration
11-14-06 11/15/06

B. Legal Sufficiency:

DS 11/20/06
Assistant County Attorney

C. Other Department Review:

Department Director

REVISED 9/03
ADM FORM 01
(THIS SUMMARY IS NOT TO BE USED AS A BASIS FOR PAYMENT.)

2006 PDRP BCC Adoption Resolution

RESOLUTION NO. _____

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS, PALM BEACH COUNTY, FLORIDA ADOPTING THE REVISED PALM BEACH COUNTY COUNTYWIDE POST DISASTER REDEVELOPMENT PLAN DATED AUGUST 2006

WHEREAS, Florida Administrative Code Section 9J-5.012(3)(b)(8), requires all Florida coastal jurisdictions to include provisions for the development of Post Disaster Redevelopment Plans (PDRP) in their Comprehensive Plans; and

WHEREAS, Palm Beach County developed and adopted a Post Disaster Redevelopment Plan in 1996; and

WHEREAS, since the federal Disaster Mitigation Act of 2000 was subsequently enacted, significant changes in PDRP guidelines have been developed and important lessons have been learned from recent disasters such as Hurricane Katrina in the Gulf and the terrorist attack of September 11, 2001; and

WHEREAS, Palm Beach County applied for and was awarded an Emergency Management and Preparedness Assistance grant from the Florida Department of Community Affairs, and a supplemental grant from the Public Entity Risk Institute, to prepare a state-of-the-art county-wide PDRP, with special attention to Long-term Recovery, Reconstruction and Economic Redevelopment decisions and actions in the aftermath of catastrophic disasters; and

WHEREAS, the revised plan is consistent with the policies, objectives and guidance outlined in the County's Comprehensive Plan, the Comprehensive Emergency Management Plan, and the Local Mitigation Strategy; and

WHEREAS, development of the Palm Beach County PDRP involved a highly participative planning process and the final revised plan was reviewed and approved by the County's PDRP Executive Committee and by the Division of Emergency Management, Florida Department of Community Affairs.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF PALM BEACH COUNTY, FLORIDA, THAT:

Section 1. The Board of County Commissioners hereby approves and adopts the revised Countywide Post Disaster Redevelopment Plan dated August 2006 in its entirety, as a reference document to guide post disaster decisions and actions at the County and city levels.

Section 2. Under the direction of the PDRP Executive Committee, the County will continue to pursue the pre-event actions and initiatives outlined in the Plan.

Section 3. The Board of County Commissioners authorizes the appropriate County Officials to pursue available funding opportunities for implementation of proposals designated therein, and will, upon receipt of such funding or other necessary resources, seek to implement the actions contained in the Plan.

2006 PDRP BCC Adoption Resolution (p2)

ATTACHMENT 2

Palm Beach County Post Disaster Redevelopment Plan

EXECUTIVE SUMMARY

Palm Beach County, like all communities, is vulnerable to disaster. Despite a long period of relative calm, Palm Beach County has a storied history of major disasters, including the infamous 1928 hurricane which still ranks as the second most deadly in U.S. history. Now during the current period of increased hurricane activity and after recent events in the Gulf States, a major hurricane hitting the county has become more conceivable, albeit just as frightening. Rather than simply hope a disaster never happens here, Palm Beach County has been proactive in increasing its ability and capacity to withstand and recover from a catastrophic disaster event.

Palm Beach County was one of the first jurisdictions in Florida to draft a Post Disaster Redevelopment Plan (PDRP) in 1996. Now, having become more sophisticated in emergency operations and hazard mitigation, the county decided it was also time to strengthen its post disaster planning. The 2006 Countywide Post Disaster Redevelopment Plan is the product of extensive research of best planning practices, lessons learned from recent catastrophic disaster events, and information gathered from participative public workshops. The purpose of the plan is to act as a single reference for guiding decision-making and action during the difficult disaster recovery period, as well as detailing actions that can be taken before a disaster strikes to speed the recovery process. It addresses disaster recovery and redevelopment issues with long-term implications. It does not address pre-disaster mitigation or immediate response and emergency operations, as those are already excellently covered by the Local Mitigation Strategy and the Comprehensive Emergency Management Plan, respectively.

The PDRP is action-oriented and outlines a countywide implementation approach. Through an Executive Committee representing county, municipal, non-profit, and private stakeholders and a flexible Working Group structure, actions outlined in the plan can be implemented as needed regardless of jurisdictional boundaries and possible staffing fluctuations in a post-disaster environment. Pre-disaster actions and annual maintenance of the plan allow the PDRP Executive Committee and Working Groups to actively prepare for a possible disaster. Post-disaster actions create a strategy for dealing with minor, major, or catastrophic disasters and are activated by the county's Executive Policy Group in concert with the PDRP Executive Committee and Recovery Branch Chief. The format of the plan allows new actions to be easily included and new participants to become involved immediately through the Working Groups. The success of the plan relies on the ease of implementation in the aftermath of a disaster and on the participants' commitment to continually strengthen it by performing "blue skies" preparations. A disaster event, while tragic, also presents a window of opportunity for strengthening communities and working toward disaster resilience. With a strong plan in place, Palm Beach County can take advantage of those opportunities and more quickly recover from a disaster should it experience one.

2006 PDRP Table of Contents

<u>2006 PDRP Table of Contents</u>	
TABLE OF CONTENTS	
1. INTRODUCTION.....	1-1
1.1 Purpose and Authority.....	1-1
1.2 How to Use this Plan.....	1-1
1.3 Relevant Plans and Policies.....	1-3
2. MAJOR POST DISASTER REDEVELOPMENT GOALS AND ISSUES	2-1
2.1 Local Government Recovery Issues	2-1
2.2 Economic and Private Sector Issues	2-7
2.3 Social and Environmental Issues	2-11
2.4 Redevelopment and Mitigation Issues	2-16
3. PLAN IMPLEMENTATION.....	3-1
3.1 Activating the Plan.....	3-1
3.2 Implementing the Plan through Working Groups.....	3-4
4. ACTION PLAN.....	4-1
4.1 Short-term Recovery Actions.....	4-2
4.2 Long-term Recovery and Redevelopment Actions.....	4-30
5. MAINTENANCE OF THE PLAN.....	5-1
5.1 Updating and Revision Process.....	5-1
5.2 Continuation of the PDRP Committee and Working Groups.....	5-2
Appendix A. Issues Index, Sources, Acronyms, & Glossary.....	A-1
Appendix B. Planning Area, Plan Summaries, & Relevant Policies.....	B-1
Appendix C. Planning Process and Documentation.....	C-1
Appendix D. Implementation Tools and Sub-plans.....	D-1
Appendix E. Actions Listed by Issue.....	E-1

CRITICAL REVIEWS OF THE 2006 PALM BEACH COUNTY PDRP

Palm Beach County's 2006 PDRP drew independent critical acclaim from a number of organizations and individuals active in the field of disaster recovery and redevelopment. Among them were the following:

Government Accountability Office

Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events

(GAO-09-811 July 2009 Report to the Committee on Homeland Security and Government Affairs, U.S. Senate)

FEMA – University of Oregon (2010)

Pre-Disaster Planning for Post-Disaster Recovery: Case Studies

Timothy Beatley (2009)

Planning for Coastal Resilience: Best Practices for Calamitous Times

Florida Department of Community Affairs

A solicited Gap Analysis vs. State PDRP Guidebook (2010)

A Review of the 2006 Palm Beach County Post-Disaster Redevelopment Plan

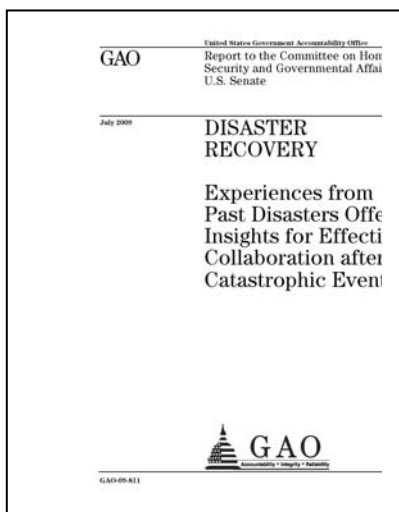
Briefs of these reviews follow.

Government Accountability Office

Disaster Recovery: Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events

GAO-09-811 July 2009

Report to the Committee on Homeland Security and Governmental Affairs, U.S. Senate



Partly as a result of experiences following Hurricane Andrew, Florida's Palm Beach County developed the Palm Beach Countywide Post-Disaster Redevelopment Plan for guiding decision making and action during the disaster period as well as detailing actions that can be taken before a disaster strikes to speed the recovery process. Palm Beach County delineates roles and responsibilities for recovery by creating working groups who will be responsible for implementing different sections of the plan, including infrastructure, economic development, and government operations. Each working group is assigned several issues to cover along with a chairperson to spearhead those activities for the county. Additionally, city departments and agencies are represented in each of these working groups.

As an outgrowth of this plan, a Business and Industry program was created that formally integrated business interests into the recovery process. Additionally, the program also created a private-public partnership comprising local, state, regional, and national businesses as well as governmental and nongovernmental organizations. According to a Palm Beach County official, partners in this program are fully engaged in the development and implementation of recovery initiatives. These collaboration efforts have resulted in improved relationships among the governmental, nongovernmental, and business entities involved in the program.

Post-disaster recovery plans can also provide a vehicle to designate roles and responsibilities for recovery, among other things. We have previously reported that well-crafted post-disaster recovery plans can clarify roles and responsibilities and help jurisdictions make progress with recovery.

Palm Beach County Division of Emergency Management, *Countywide Post-Disaster Redevelopment Plan, Palm Beach County, Florida*, (West Palm Beach, FL: August 2006), <http://www.pbcgov.com/publicsafety/emergencymanagement/recovery/recovery.htm>

Collaborating organizations can work together to define and agree on their respective roles and responsibilities. In doing so, they can collectively agree on who will do what, organize joint and individual efforts, and facilitate decision making. One way to delineate roles and responsibilities for disasters is through planning. For the emergency response phase, the National Response Framework sets out the roles and responsibilities of key partners at the local, tribal, state, and federal levels. Responsibilities for recovery stakeholders are detailed in ESF #14, the Long-Term Recovery Annex. The annex mostly addresses the responsibilities of federal agencies involved in recovery.

Because state and local governments play a lead role in disaster recovery, it is also important for their roles and responsibilities to be clearly delineated. After past disasters, this information has been delineated through long-term community recovery plans. Communities can develop such plans either before or after a disaster occurs. Post-disaster recovery plans typically include detailed projects and approaches to rebuild a community based on the damage and impacts of the specific disasters. Some communities have supplemented post-disaster plans by conducting planning efforts prior to a disaster.

Pre-Disaster Planning for Post-Disaster Recovery: Case Studies

Prepared for FEMA by University of Oregon (March 2010)



Table of Contents	
Chapter I: Introduction	1
Background	1
Purpose and Methods	2
Organization of this report	3
Chapter II: Framework for this analysis	4
Flooding in the U.S.	4
The Community Rating System (CRS)	5
Long Term Post-Disaster Recovery Planning - Defined	6
Why Plan for Post-Disaster Recovery?	7
How to Plan for Post-Disaster Recovery?	8
Relationship of post-disaster planning to the CRS	9
Chapter III: Case studies	11
Palm Beach County, Florida	11
Community and Hazard Background	12
Plan Development	12
Plan Elements	14
Plan Implementation	15
Conclusions	15
Process Conclusions	15
Land Use Conclusions	16
Other Conclusions	16
Polk County, Florida	16
Community and Hazard Background	18
Plan Development	18
Plan Elements	19
Plan Implementation	20
Conclusions	20
Process Conclusions	20
Land Use Conclusions	21
Other Conclusions	21
Hillsborough County, Florida	21

CHAPTER 3: CASE STUDIES

This chapter presents the results of CPW's review of post-disaster recovery plans in the four case study jurisdictions: Palm Beach County, Florida; Polk County, Florida; Hillsborough County, Florida; and Tillamook City, Oregon. CPW conducted considerable research to identify candidate jurisdictions. We ultimately chose three jurisdictions in Florida due to the state's initiative to develop post-disaster redevelopment plans. We selected Tillamook, Oregon because of its efforts in redevelopment planning which resulted from years of repetitive flood losses, particularly in areas along Highway 101.

To complete the case studies, CPW reviewed the plans and related materials from the case study jurisdictions' web sites and conducted interviews with local staff. Each case study is organized into four sections:

- Community and Hazard Background
- Plan Development
- Plan Elements
- Plan Implementation
- Conclusions

PALM BEACH COUNTY, FLORIDA

Palm Beach County's efforts focus on economic recovery. The County initiated its planning efforts in 2005, adopted the plan in August of 2006, and has not experienced a major flood disaster since preparation of the plans. A copy of the post-disaster redevelopment plan can be found on the County's website:

http://www.pbcgov.com/publicsafety/emergencymanagement/resources/pdf/pdrp_AUG_06.pdf.

FEMA – University of Oregon (2010)

University of Oregon/FEMA Case Study on Palm Beach County's PDRP

The Community Workshop of the University of Oregon, as part of its march 10, 2010 study for FEMA entitled “*Pre Disaster Planning the Post Disaster Recovery*”. Independently found and reviewed Palm Beach County's 2006 PDRP and prepared a very positive case study. Among its conclusions and observations were the following:

Process Conclusions

- Developing a post-disaster recovery plan is an opportunity to encourage collaboration between planners, emergency managers, and economic development partners.
- Building these relationships may have more impact than the plans they create
- It is important to do sufficient background research and preparation before holding a workshop; holding workshops too early can be problematic.
- To encourage participation and buy-in, staff should use local resources and organizations to help organize the post disaster planning process.
- There is no one process template for every community; however a participatory approach informed by an executive committee and technical support seems to be effective.

Land Use Conclusions

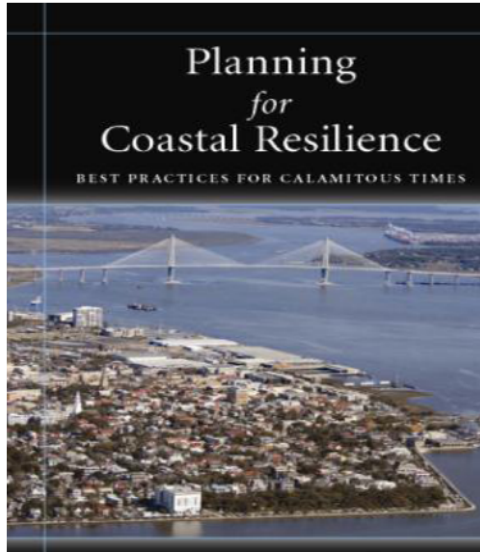
- Land use issues are highly integral to effective post-disaster redevelopment. However, they are also the most contentious.
- Understanding a the impacts of land use decisions in relation to community's overall vision and political environment helps to make a more effective plan.

Other Conclusions

- Action matrices are helpful in making plan implementation happen.
- Integrating post-disaster redevelopment planning into other plans is important, even if the integration is relatively minimal at first.
- Private public partnerships can be used to encourage and support post-disaster recovery planning in the business community.
- Planning for economic recovery is important. Finding ways to use local resources first takes pre-disaster organization and coordination.
- Communities shouldn't be completely reliant on state or federal resources that don't understand local needs.

Planning for Coastal Resilience: Best Practices for Calamitous Times

By Timothy Beatley
July 2009



Contents

Introduction: Climate Change and Coastal Resilience

I. Coastal Resilience: Background and Vulnerability

- Chapter 1: Coastal Resilience: What is it?
- Chapter 2: Vulnerability of Coastal Communities

II. Approaches to Planning for Coastal Resilience

- Chapter 3: Coastal Resilience: Key Planning Dimensions
- Chapter 4: Barriers to Coastal Resilience
- Chapter 5: Understanding the Political Setting and Context
- Chapter 6: Principles of Coastal Resilience
- Chapter 7: Tools and Techniques for Enhancing and Strengthening Coastal Resilience

III. Best Practices in Planning for Coastal Resilience

- Chapter 8: Worcester County, MD
- Chapter 9: Cannon Beach and northwest Oregon coast
- Chapter 10: Palm Beach County, FL
- Chapter 11: Charleston County, SC
- Chapter 12: New Orleans and resilience after Katrina
- Chapter 13: Brief Coastal Resilience Profiles
 - La Plata, MD
 - Kinston, NC
 - Loreto Bay, Mexico
 - Maui County, HI
 - Solara, San Diego County, CA
 - Noisette, North Charleston, SC

- Conclusions: The Promise of Coastal Resilience
- References

In *Planning for Coastal Resilience*, Beatley writes that coastal resilience must become the primary design and planning principal to guide all future development and all future infrastructure decisions. Resilience, the author explains, is a profoundly new way of viewing coastal infrastructure – an approach that values smaller, decentralized kinds of energy, water, and transport more suited to the serious physical conditions coastal communities will likely face. Implicit in the notion is an emphasis on taking steps to build adaptive capacity, to be ready ahead of a crisis or disaster. It is anticipatory, conscious, and intentional in its outlook.

After defining and explaining coastal resilience, Beatley focuses on what it means in practice. Resilience goes beyond reactive steps to prevent or handle a disaster. It takes a holistic approach to what makes a community resilient, including such factors as social capital and sense of place. Beatley provides case studies of five U.S. coastal communities (including Palm Beach County), and “resilience profiles” of six North American communities, to suggest best practices and to propose guidelines for increasing resilience in threatened communities.

Gap Analysis of 2006 PDRP by the Florida Department of Community Affairs

A Review of the 2006 Palm Beach County Post-Disaster Redevelopment Plan

Introduction

The Palm Beach County Post-Disaster Redevelopment Plan (PDRP) was developed in late 2005-2006 and is a pioneer in pre-disaster planning for long-term recovery. The plan covers a wide array of topics and many actions that, when implemented, will help ensure that the county:

- experiences faster and more efficient recovery,
- maintains local control over the process and
- takes advantage of opportunities to build back better.

Since the development of the plan, the State of Florida has completed a 5-Year initiative to further define Post-Disaster Redevelopment Planning and the elements of a successful plan. This guidance can be found in “Post-Disaster Redevelopment Planning: A Guide for Florida Communities,” released by the Florida Department of Community Affairs and Florida Division of Emergency Management in October 2010. At the request of the Palm Beach County Division of Emergency Management, the following courtesy assessment reviews the Palm Beach Post-Disaster Redevelopment Plan in light of this new guidance and offers suggestions for strengthening the plan during the next scheduled update kicking off in 2011. Overall it should be noted that the Palm Beach PDRP is an exemplary document that has the potential to be very successful in its current capacity. The guidance contained in the guidebook was gleaned from many different efforts, including that of Palm Beach County. No one community has accomplished all of these tasks. The Statewide Guidance suggests an incremental approach to post-disaster redevelopment planning. The following suggestions might be best accomplished over time. It is not expected that the county will respond to all of these suggestions at the time of their next update.

Planning Process

The Planning Process is documented on page 16 of the Post-Disaster Redevelopment Planning Guidebook and detailed throughout Chapter Two. This process was largely followed by Palm Beach County when developing their plan; however there are some additional tasks the county may wish to include during their scheduled update.

Plans Assessment

The current Palm Beach County PDRP summarizes policies from the three main relevant plans – the local comprehensive plan, Local Mitigation Strategy (LMS) and Comprehensive Emergency Management Plan (CEMP). Since this last update, both plans have undergone a significant update (the PBC Comprehensive Plan in 2007, LMS in 2009 and CEMP under current revision) and changes to these plans should be reviewed. In addition to this, to make this a county-wide strategy, relevant sections

from municipal local comprehensive plans should be reviewed and included as well. Since this could be a significant undertaking, it is suggested that a targeted approach be taken with involving municipalities. More about municipal involvement can be found below in the Stakeholder Involvement Section.

The County may consider reviewing other relevant plans and policies such as Disaster Housing Strategy, Debris Management Plans, Long-Range Transportation Plans, Dike Breach Outreach/Recovery Plans, Economic Development Plans, Land Acquisition Programs, Beach Renourishment Plans, Land Development Codes, Community Redevelopment Agency Plans and other vision documents. It is important to ensure that the Post-Disaster Redevelopment Plan functions as a guide that provides direction on how to implement other relevant local plans and in order to do this properly, you must first take inventory of what is already in existence.

In addition to this the Palm Beach County Comprehensive Emergency Management Plan Recovery Annex has been significantly modified to focus more on Long-Term Recovery. The ties between this Recovery Annex and the PDRP should be further fleshed out and clear points of transition between the two documents should be made as well as clear transitions between the organization's managing the efforts. The County should also pay close attention to the work at the National level through ESF-14 to ensure that the resources available through this function are noted and properly used during long-term recovery.

Capacity Assessment

The Capacity of Palm Beach County may have shifted over the past 5 years due to budget cuts or constraints. Therefore this should be re-evaluated. In addition to this, the county may have begun new initiatives over the past five years that have strengthened its current capacity. These initiatives may include the county's extensive Public-Private Partnership Network and sustainability initiatives. Both of these initiatives are also referenced in the review actions included in this report. The county may wish to include a short synopsis of each new initiative that relates to the post-disaster redevelopment plan or long-term recovery as well as a contact person for each initiative. It may be appropriate to include this representative on appropriate working groups or Technical Advisory Committees as necessary.

In addition to new initiatives in the county, new organizations and existing organizations that may have not been included in the original planning process should be included as a resource evaluated during the capacity assessment. Specifically, the county may wish to reach out to its current Long-Term Recovery Organizations including Palm Beach Disaster Recovery Coalition, Rivera Beach Community Coalition and the Glades Area Recovery Team. These organizations are familiar with the recovery needs of the community and can help coordinate volunteer activities, even during the long-term recovery process. For more information on the capacity assessment see page 25 in the Guidebook.

The county may also want to evaluate its current financial capacity to handle a disaster recovery situation. This could include financial reserves, mutual aid agreements, bond capacity, etc. For more information on how the community might take on this task, see pages 115-117 in the Guidebook.

Vulnerability Analysis

Currently, the County does not include a vulnerability assessment in their Post-Disaster Redevelopment Plan. This may be because the plan chose to use the vulnerability assessment found in the Local Mitigation Strategy, a practice local governments are encouraged to do in the statewide guidance. However, this vulnerability assessment may have been updated in 2009 and should be re-reviewed. It might be relevant to include certain maps from these this document as well, especially if the county chooses to target specific areas for acquisition or mitigation. In addition to this, some communities have chosen to augment their vulnerability analysis to include additional tasks that may not be included in a typical LMS. These tasks may include:

- Developing one or more scenarios that include descriptions of long-term impacts. This is often helpful to communities when exercising the Post-Disaster Redevelopment Plan and can help to focus the scope of the plan for participants (p. 29).
- Analyze the different land uses within hazard zones. In 2005 the Florida Department of Community Affairs conducted an analysis of the land uses found within areas subject to flooding, coastal storm surge, wildfire and sinkholes. Furthermore, in 2006 a similar, yet more detailed analysis was conducted specifically for the Glades Communities of Palm Beach County (Belle Glade, Pahokee and South Bay). While this information may be out-of-date it would be a good starting place. Copies of these reports along with maps that analyze the land uses in vulnerable areas can be found on the Department's website:
 - o Palm Beach County Profile:
<http://www.dca.state.fl.us/fdcp/dcp/hazardmitigation/Counties3.cfm>
 - o (Scroll down to the bottom –alphabetical order).
 - o Glades Communities Profiles:
<http://www.dca.state.fl.us/fdcp/dcp/hazardmitigation/Municipalities.cfm>
 - o (all listed on page in alphabetical order).
- Analyze your community's non-conforming structures and uses. This could be a simple inventory and may specifically target Repetitive Loss and Severe Repetitive Loss areas for specific action in the post-disaster environment. Your LMS may have more information on repetitive loss properties and your growth management department should have information on non-conforming uses.
- Ensure a solid understanding of the infrastructure and facilities likely to be damaged (p. 30)
- Analyze your community's social vulnerability to disasters. This may be especially useful to identify areas with large concentrations of elderly, special needs or non-English speaking folks who may need additional forms of specific assistance in the long-term recovery process. As the latest information comes out from the 2010 Census, it will be very important for the county to review their

current demographics to see if new issues have presented themselves over the past 10 years. For more information see page 30 in the guidebook and visit: www.sovius.org

- Analyze your local economic vulnerability to disasters. This is an advanced task that has probably been explored significantly through the County's ESF-18 and Public-Private Partnership work that has been completed over the past 5 years. This information should be documented in the county's plan. A great resource for long-term economic recovery that may be useful as the county augments this section of the plan is: <http://restoreyoureconomy.org/>
- Conduct a financial impact analysis (p. 32).
- Conduct an environmental or habitat impact analysis (p. 32).
- Analyze your community's designated historic sites and structures. Through this review, no evidence of participation from the Historical Society of Palm Beach County or other agencies focused on historic and cultural preservation was noted. The community may wish to undertake a specific vulnerability analysis of its historic structures and consider inviting a representative from this community to the PDRP Committee.

Stakeholder Involvement

The Palm Beach County PDRP had wide representation from many different groups invited to participate in the planning process, however, as has been experienced in many of the planning

processes involvement tended to wane over time. The county may wish to adopt a model that uses the current PDRP Executive Committee as a steering group and expand the membership of the sub-committees involved in the process. Page 23 in the Guidebook contains a list of potential stakeholders who could be included in the process. Specifically, Palm Beach County should consider including someone from the Historical Society of Palm Beach County and additional representation from the Office of Economic Development working specifically on the issue of sustainability.

In addition to expansion of the committees involved in the planning process, the county should actively seek out more participation from the municipalities in Palm Beach County. During the original planning process James Titcomb, Executive Director of the Palm Beach League of Cities, served as the Acting Chairperson of the PDRP Executive Committee. This was a great strategy that ensured that the issues that the municipalities experience were broadly addressed and brought to the table. In addition to this, representatives from Boca Raton, Juno Beach, Wellington, Greenacres and South Bay were also included in the Executive Committee. While it would be very difficult to include all 37 municipalities in the planning/update process, the county should develop some actions that specifically target these communities to make sure they are aware of the plan and how they can be involved. The PDRP contains a Municipal Participation Form (page C-12) designed to solicit feedback specifically from the other jurisdictions within the county. This was a great concept that recognized the need for further outreach to cities as the plan was implemented. If this form was used over the past 5 years, the feedback gained should be incorporated into this update and

the communities should be contacted again to make sure the information still holds true. This worksheet could also be used during the update of the plan.

Municipal Insolvency was addressed as an issue in the plan with three actions associated, including:

- Establish procedures for municipalities receiving financial assistance from the County (LG-34)
- Assist municipalities in developing Continuity of Operations Plans (COOP) and coordinate with county COOPs (LG-35)
- Information sharing between municipalities and county (LG-36).

Any work related to these three actions would also help to develop municipal awareness and support.

In addition to this, the Coastal Resilience Index created by the Gulf of Mexico Alliance is a great facilitation tool to use when communicating risk and the need for long-term recovery following disasters to smaller jurisdictions that may not be well versed in hazard mitigation and recovery. Information on this tool can be found online at: www.masgc.org/ri.

PDRP Issues and Actions

Below is a crosswalk that compares the issues found in the Statewide Guidance Document and those identified in the Palm Beach Post-Disaster Redevelopment Plan. The Shading of the box indicates the achievement level: White = Minimum, Light Blue = Recommended and Darker Blue = Advanced. For a full description on the levels of achievement see page ii in the guidebook.

ISSUES IDENTIFIED IN STATEWIDE GUIDANCE	COMMENTS ON PALM BEACH COUNTY PDRP
LAND USE	
Phased reconstruction and streamline permitting	Palm Beach County currently has a Post-Disaster Temporary Permit Suspension Ordinance (Article XXII, Section 7). Action RM-8 on page E-35 suggests some additional tasks that could be taken to strengthen this provision. See page 46 in the Guidebook for more information.
Build back standards for nonconforming and substantially damaged structures	Action RM-2 on page E-34 suggests lowering the threshold for bringing non-conforming uses into compliance to 40 or 45% damaged and RM-11 on page E-27 calls for a non-conforming structure inventory. This inventory would be extremely valuable in the aftermath of a disaster. For more information see page 47 in the Guidebook.
Controlling long-term post-disaster blight	Action LG-18 on page E-6 “Establish housing demolition protocols” suggests that protocols for demolition of destroyed

	homes be established. Long-term blight eradication after a disaster is a major issue. The county should take some of the steps laid out in this action as well as look at some of the actions taken by the City of New Orleans, post-Katrina on this issue to gain further insight. See page 48 in the Guidebook for more information.
Reducing disaster vulnerability through voluntary mitigation programs	Including mitigation in rebuilding is addressed as a major issue in the Palm Beach County PDRP and therefore there are a number of actions suggested under this umbrella these including: ▪ Partner with home improvement stores and major home builders to advocate structural hazard mitigation (RM-17) ▪ Expand One-Stop Permitting Centers to include mitigation information (RM-18) ▪ Institute landscaping and invasive vegetation public education campaign (RM-19) In addition to these programs, the county may wish to explore land acquisition programs for highly vulnerable areas (see also Action Item RM-13 regarding CLASC). For more information see page 49 in the Guidebook.
Prioritizing areas to focus redevelopment	Palm Beach County hasn't yet begun to identify areas on a map for focused redevelopment. Although there is an action looking at Revitalization, Redevelopment and Infill Overlays which concern wind damage vulnerability (RM-14). The concept of Priority Redevelopment Areas is an advanced task accomplished successfully by Hillsborough County that Palm Beach County may be interested in pursuing. For more information see pages 50-51 in the Guidebook.
Historic Preservation and restoration	Restoring Educational, Cultural and Historic Amenities was included as an issue in the Post-Disaster Redevelopment Plan and two action items were included to address this subject: ▪ Assisting Educational and Cultural Facilities with finding funding for repairs and restoration (SE-7) ▪ Tax Breaks for Historic Structure Restoration (SE-8) As mentioned during the analysis of the vulnerability assessment, a risk analysis of all historic structures in Palm Beach County could help the county identify their most vulnerable structures to target for mitigation. This would be an appropriate addition to the LMS if it hasn't already been accomplished. For more information see page 52 in the Guidebook.
Reducing disaster vulnerability through land use and development regulations	Limiting Redevelopment in Hazardous Areas was included as an issue in the plan and in addition to addressing non-conforming uses, the following actions were proposed: ▪ Petition FDCA for expedited Comprehensive Plan amendment review/approval (RM-12) ▪ Renew funding for Conservation Land Acquisition Selection Committee purchases (RM-13) ▪ Establish Revitalization, Redevelopment, and Infill Overlays (RRIO) in areas that experienced severe wind

	damage (RM-14) ▪ Down-zoning undeveloped parcels in hazard-prone areas (RM-15) ▪ Initiate municipal cooperation in Transfer of Development Rights Program (RM-16) For more information see page 53 in the Guidebook.

HOUSING	
Temporary housing sitting criteria, provision and removal	Availability of temporary housing/long-term sheltering was identified as the top priority issue for Palm Beach County. Quite a few actions are included to address this issue: ▪ Creation of a vacant lands inventory (for placement of temporary housing units) (LG-1) ▪ Housing stock analysis to identify the most vulnerable housing (LG-2) ▪ Inform Damage Assessment Teams (DA) of temporary housing and long-term shelter sites (LG-3) ▪ Pre-arranged agreements with hotels to house government employees and aid agreements (LG-4) ▪ Assistance in finding rental units for temporary housing (LG-5) ▪ Create an on-site employee housing permit (LG-6) ▪ Designate Long-term Shelters (LG-7) ▪ Analysis of damage assessment findings (LG-8) ▪ Subsidize long-term temporary housing (LG-9) The county may also wish to explore on-site temporary housing in residential areas as well. The State of Florida is now encouraging disaster housing to be located on the site of the homeowners damaged home, if at all possible and safe, as it supports faster reconstruction and maintains a sense of community. For more information see page 56 in the Guidebook.
Ability to reconstruct homes rapidly	Shortage of contractors/supplies slowing down the repair of homes and businesses was identified in the top ten issues in the Palm Beach PDRP. To address this, the following actions were proposed: ▪ Encourage contractors and citizens to maintain pre-arranged agreements for hurricane repairs (EP-15) ▪ Provide staging areas for contractors and repair (EP-26) ▪ Stockpile temporary repair and/or construction materials needed for immediate repairs to public facilities (EP-27) ▪ Develop incentives for large construction firms to take part in the repair and reconstruction process (EP-16) During the update of the plan the county may also consider volunteer coordination of assistance available to repair low-income housing and also include actions to encourage local contracting support on housing repair. See page 57 in the Guidebook for more information.
Transitioning residents back to permanent housing	In the Palm Beach County PDRP this topic is partially addressed through the issue, “Reducing Incidence of Fraudulent and

	Unethical Practices” through the following actions: ▪ Create public education campaign to inform citizens of services offered by the county (SE-1) ▪ Provide Personal Finance Consultation Services at Community Redevelopment Centers (SE-2) ▪ Educate the public on risks of using unlicensed contractors (SE-24) ▪ Preventing predatory real estate investment and ‘house flipping’ (SE-4) ▪ Establish a countywide liaison with the State Attorney General fraud task force (SE-5) ▪ Establish housing demolition protocols (LG-18) More information may be available on this transition in the local disaster housing strategy. If this has been developed, it should be included in the plan review and if not an action to create this strategy should be included. For more information see pages 58-59 in the Guidebook.
Rebuilding affordable housing	Including affordable housing in redevelopment projects is one of the top ten priorities in the Palm Beach County PDRP. There are four actions associated with this issue including: ▪ Adopting a ‘No Net Loss’ Resolution (RM-20) ▪ Addressing Post-Disaster Redevelopment in the County Workforce Housing Program Regulations (RM-21) ▪ Expediting grant and loan funding processes (RM-22) ▪ Creating Community Land Trusts (RM-23) For more information see page 59 in the Guidebook.
Encouraging homeowners to incorporate mitigation during rebuilding	Including mitigation in rebuilding is addressed as a major issue in the Palm Beach County PDRP and therefore there are a number of actions suggested under this umbrella including: ▪ Partner with home improvement stores and major home builders to advocate structural hazard mitigation (RM-17) ▪ Expand One-Stop Permitting Centers to include mitigation information (RM-18) ▪ Institute landscaping and invasive vegetation public education campaign (RM-19) These actions work towards this issue as well as the issue: Reducing disaster vulnerability through voluntary mitigation programs and land use and development regulations. For more information see page 60 in the Guidebook.

ECONOMIC REDEVELOPMENT

Resumption and retention of major employers	Avoiding permanent relocations of core businesses outside of the community is an issue that has many actions associated with it, including: ▪ Create Downtown Improvement Districts (BID) in downtown and retail centers (EP-9) ▪ Advertise the quick recovery and resumption of business to the nation (EP-10) ▪ Produce statistics for post-disaster economic environment

	for better marketing business opportunity and discovering needs (EP-11) ▪ Hold an economic development charette for the business community after a disaster (EP-12) ▪ Beautification/landscaping for tourism (EP-13) ▪ Adjusting incentive packages (EP-14) ▪ Develop special post-disaster incentive packages to entice businesses to remain in Palm Beach County (EP-25) Many of these actions will most likely address the additional issues below concerning economic redevelopment. Palm Beach County has made great strides in long-term economic recovery and redevelopment. For more information on resumption and retention of major employers see page 63 in the Guidebook.
Small business assistance	The ability of small businesses to stay afloat until adequate financial assistance is available is another issue that Palm Beach County created many actions to support, including: ▪ Locate possible sites for post-disaster temporary office space (EP-2) ▪ Make arrangements to secure mobile units/trailers for temporary office space (EP-22) ▪ Establish criteria for placing small businesses in temporary office sites (EP-23) ▪ Locate possible sites for Business Recovery Centers (EP-3) ▪ Secure supplies for temporary offices and business recovery centers (EP-4) ▪ Coordinate with Workforce Alliance to co-locate services with Business Recovery Centers (EP-5) ▪ Encourage local physicians to create a coalition/network focusing on post-disaster recovery or enter into mutual aid agreements (EP-24) ▪ Assist small businesses with continuity planning and mutual aid agreements (EP-1) ▪ Establish Business Recovery Centers (EP-6) ▪ Establish temporary office sites (EP-7) ▪ Provide wireless internet access hubs throughout the community (EP-8) ▪ Provide short-term children's activities until regular school and child-care facilities are available (EP-29) For more information on small business assistance see pages 64-55 in the Guidebook.
Workforce Retention	The retention of workforce is directly related to the ability of businesses to survive. Therefore the two topics above help to accomplish this task, however there are some additional actions described in the plan that support this issue including those related to the use of local business capabilities in disaster recovery: ▪ Create a Public-Private Partnership Network to supplement governmental recovery/redevelopment activities (LG-37)

	▪ Include local businesses in pre-arranged contracts for recovery and redevelopment (LG-38) ▪ Organize a post-disaster potential subcontractors meeting (LG-39) For more information on workforce retention see page 66 in the Guidebook.
Tourism Renewal	The topic of tourism renewal is not addressed specifically in the Palm Beach County PDRP, however the following actions could be used to support this topic: ▪ Beautification/landscaping for tourism (EP-13) ▪ Advertise the quick recovery and resumption of business to the nation (EP-10) For more information on tourism renewal see page 67 in the Guidebook.
Physical economic redevelopment projects	The Palm Beach County PDRP doesn't include any physical economic redevelopment projects; however it does include an action to create Downtown Improvement Districts (BID) in downtown and retail centers (EP-9). This might be because these projects are listed in other documents such as economic development strategic plans or the Local Mitigation Strategy. However, it would be helpful to note them in the plan as well if they are in alternative documents. This might be best accomplished in the plans review section. See page 68 in Guidebook for more information.
Opportunities to sustainably restore economic vitality	The Palm Beach County PDRP doesn't currently include a focus on sustainability during redevelopment. However, the Palm Beach County Strategic Economic Development Plan lists sustainability as one of its five strategies to guide future development. Specifically the plan states, "Enhance the natural environment's sustainability in making the land use/transportation connection and establish alternative energy policies for sustainability of the built and natural environment." <i>Palm Beach County Strategic Economic Development Plan</i>, March 2007, p. 5. The next update might consider ways to bridge these two documents. For more information see page 69 in the Guidebook.

INFRASTRUCTURE AND PUBLIC FACILITIES

Infrastructure for temporary recovery operations	Temporary recovery operations have been addressed in the Palm Beach County PDRP through many different issues and action items such as temporary housing and siting criteria. Actions that work towards this issue include: ▪ Vacant Lands Inventory (LG-1) ▪ Identify potential debris sites in municipalities (LG-14) ▪ Locate possible sites for post-disaster temporary office space (EP-2) ▪ Make arrangements to secure mobile units/trailers for temporary office space (EP-22) ▪ Establish temporary office sites (EP-7)

	The focus of this issue is the placement of temporary infrastructure that furthers permanent infrastructure development. When selecting temporary recovery operations the county should try to connect these temporary uses with places that could be permanent in the future or at least are slated for development in the future so that any investments in temporary infrastructure can be used in the future. For more information see page 74 in the Guidebook.
Debris management	While debris removal is a short-term recovery issue, the management of that debris has long-term implications. The Palm Beach County PDRP recognizes this as one of their top 10 priority issues for long-term recovery and have developed the following actions to address debris management and disposal: ▪ Create municipal debris management plans (LG-10) ▪ Secure Pre-event contracts from non-local waste collectors (LG-11) ▪ Determine pre-existing conditions at all Debris Collection sites (LG-12) ▪ Annual reassessment of debris collection sites (LG-13) ▪ Identify potential debris sites in municipalities (LG-14) ▪ Promote recycling of surplus materials from reconstruction activities (LG-16) ▪ Create public education for the proper segregation of debris (LG-17) ▪ Establish housing demolition protocols (Lg-18) ▪ Coordinate burning with FL Division of Forestry (FDOF) (LG-19) Additional guidance on debris management plans has been released from the Florida Division of Emergency Management since the creation of this plan. The latest Palm Beach County Debris Management Plan should be consulted during the update of this plan. For more information see page 75 in the Guidebook.
Financing infrastructure and public facilities repair	The Palm Beach County PDRP doesn't fully address how public facility repair will be financed, however Appendix D.8 contains a list of post-disaster recovery funding resources. In addition to this the following actions were created: ▪ Maintain current infrastructure designs and electronic back-up files (LG-20) ▪ Budget outlays for new design and reconstruction (LG-21) ▪ Prearranged contracts with non-locals for repairs or supplies (LG-15) The county should also consider pre-arranged contracts with local repairs when available. While this is mentioned in the description of Action LG-15, a specific action to take on this task was not found. For more information on how to augment these actions see page 76 in the Guidebook along with page 115 on financing implementation of the plan. Also, a companion list of recovery resources has been developed that could augment Appendix D.8. This can be found online at:

	http://www.dca.state.fl.us/fdcp/dcp/PDRP/Files/ToolBox/FundingResourcesCompanionHandbook.pdf For more information see page 76 in the Guidebook.
Infrastructure and public facilities mitigation and historic considerations	Infrastructure and public facilities mitigation is addressed through Action RM-24: - Public facility retrofits/repairs built to exceed current standards. Restoring historic amenities is touched on through the following actions: - Assisting Educational and Cultural Facilities find funding for repairs and restoration (SE-7) - Tax breaks for historic structure restoration (SE-8) While both topics are addressed, the Palm Beach County PDRP could be revised to include more information/actions in these two areas. These may be subjects already adequately addressed in the Local Mitigation Strategy (where they would more appropriately belong), but that information should be captured in this plan or at least point to the LMS as the source of info for infrastructure mitigation to make sure the connection is made during long-term recovery. To better address historic facility mitigation, the state in partnership with 1000 Friends of Florida has prepared a couple of guidance documents. Links to both of these are below: http://www.1000friendsofflorida.org/PUBS/HistoricalDisaster/1000%20Friends%20Book.pdf http://www.1000friendsofflorida.org/PUBS/HistoricalDisaster/ManualFinal.pdf For more information see page 77 in the Guidebook.
Relocation of vulnerable infrastructure and public facilities	The Palm Beach PDRP addresses the relocation of vulnerable infrastructure and public facilities through different issues and actions that have already been stated above. These are mostly related to land use decisions to limit development in hazardous areas. As was mentioned above, the county may have plans that explore the relocation of vulnerable infrastructure, but they were not referenced in the plan. This may appropriately belong in the Capital Improvements Element or Metropolitan Planning Organization's Long-Range Transportation Plan. If there are other documents that address this issue they should be mentioned in the plans or capacity assessment of the PDRP. For more information on the relocation of vulnerable infrastructure in the Guidebook see page 77. For additional information the county may want to look at a recent guidance document released by the FSU Department of Urban and Regional Planning and Florida Division of Emergency Management, "Taking the High Road: Integrating Hazard Mitigation into Long-Range Transportation Planning." If requested, this document can be delivered to the county electronically. For more information see page 78 in the Guidebook.

Regional infrastructure consideration	Regional considerations haven't been taken into consideration from a multi-county perspective in the Palm Beach County PDRP. However, the Treasure Coast Regional Planning Council recently received funding to create a regional vulnerability analysis and it is expected that infrastructure vulnerability will be a component of this project. The county should coordinate with TCRPC on this project and use this information during the next update of their Post-Disaster Redevelopment Plan. For more information see page 79 in the Guidebook.
Enhanced infrastructure capacity to priority redevelopment areas	The concept of Priority Redevelopment Areas is not discussed in the Palm Beach County PDRP, however the plan does recognize the existence of Revitalization, Redevelopment and Infill Overlays (RRIO) in the comprehensive plan, which could be used as a vehicle for prioritizing redevelopment following a disaster. If the RRIO mechanism is used during long-term recovery, infrastructure capacity and provisions should be a main component explored during the planning phases. For more information see pages 79-80 in the Guidebook.

HEALTH AND SOCIAL SERVICES

Health facility restoration	Health facility restoration is an important consideration for Palm Beach County due to the vulnerable location of some hospitals. Currently there are two actions that address the continuity of health services including: - Assess capabilities of hospital system and medical transport services to cope with non-operational hospitals (SE-25) - Provide a mobile health unit (SE-28)
Social service provision to socioeconomic vulnerable populations	Fair and Equitable Distribution of Disaster Assistance is an issue addressed by the Palm Beach PDRP that takes into account social service provisions to socioeconomic vulnerable populations. The following actions have been proposed: - Prioritize Low Income Census Tracts for Recovery Resources (LG-23) - Provide multi-lingual assistance to communities throughout the county (LG-25) The county may also want to prepare for increased social service need following a disaster. This could include the need for extra disaster case workers or social workers. Additional information on this subject can be found in the Guidebook on pages 84-85.
Public safety service levels re-established throughout the community	The Palm Beach County PDRP doesn't address re-establishing public safety service levels throughout the community. However, this could be something more adequately addressed in another plan such as the short-term recovery portion of the Comprehensive Emergency Management Plan. The county should examine other planning documents to make sure this issue is addressed and capture the appropriate document for implementing actions regarding re-establishing public safety in the Post-Disaster Redevelopment Plan. See pages 85-86 in the

	Guidebook for more information.
Coordination and assistance for non-governmental organizations and volunteers	The Palm Beach PDRP contains an Action to establish procedures for securing donations and services from the private section (LG-22). The actions associated with this issue should ideally be connected with the activities of ESF-15 (Volunteers and Donations) and be included in the Standard Operating Procedures that lay out the specific responsibilities of ESF-15. Many CEMPs do not adequately address the long-term responsibilities of ESF-15. The county should consider including this in the update of their Recovery Annex, if not already included. In addition to this, the county should determine how the Long-Term Recovery Organizations can be included in any actions associated with this issue. For more information see page 86 in the Guidebook.
Provide for special needs populations throughout long-term redevelopment	While the topic fair and equitable distribution of disaster assistance touched on social services for socioeconomic vulnerable populations, special needs populations such as children and elderly were not addressed during the long-term redevelopment period. This could be because Palm Beach County has another planning document that addresses this issue. If this is the case, it should be noted in the PDRP where this information can be found. For more information on this topic, see page 87 in the Guidebook.
Public transportation restoration and improvement	Currently, there are no actions addressing public transportation restoration and improvement in the Palm Beach County PDRP. The County might consider adding a representative from Palm Tran to the committee to discuss how public transportation might assist in the disaster recovery process. Specifically coordinating any temporary disaster housing sites with the current Palm Tran bus routes or considering altering routes temporarily after a disaster to accommodate temporary housing sites, if needed. For more information see page 88 in the Guidebook.
Schools, higher education reopened	The Palm Beach County PDRP contains an action that addresses the provision of short-term children's activities until regular school and child-care facilities are available (EP-29). In addition to this, the county may want to include a representative from the School District of Palm Beach County as well as representation from Palm Beach County State College, Palm Beach Atlantic University, Northwood University, etc. to discuss the vulnerability of campus locations, if appropriate and long-term continuity. Planning for schools and higher education facilities should be coordinated with disaster housing as schools are often used as temporary shelters in the short-term recovery phase. For more information see page 89 in the Guidebook.
Mental and behavioral assistance	Adequate health and mental health services are addressed through several actions in the plan. This includes: - Encourage Employee Assistance Programs to address post-disaster mental health (SE-27) - Coordinate with the American Psychological Associations (APA) Disaster Outreach Program and SAMHSA Project Hope and Recovery (SE-6)

	For more information see page 90 in the Guidebook.
Medical personnel retention and recruitment	Recognizing that many local physicians are also small business owners, the Palm Beach County PDRP includes an action to encourage local physicians to create a coalition/network focusing on post-disaster recovery or enter into mutual aid agreements (EP-24). In addition to this many hospitals most likely have their own agreements and plans in place to address continuity and recruitment following a disaster. The county may wish to coordinate with the local large medical facilities to ensure that they have these plans, especially in vulnerable locations. For more information see page 91 in the Guidebook.
Health-related pollution and environmental justice	The Palm Beach County PDRP addresses unhealthy levels of mold in damaged structures as an issue with two actions associated: ▪ Educate the public of the health risks of mold (SE-22) ▪ Provide information and oversight of mold infestation (SE-23). Other environmental health concerns the county may wish to address includes hazardous waste, asbestos removal during structure demolition, etc. The county should ensure that when planning debris removal sites or conducting activities that are necessary but may be considered a nuisance that one particular population group is not inordinately burdened. Any inordinate burden imposed by land use decisions following a disaster should also be avoided. For more information see page 92 in the Guidebook.
Quality of life factors	The Palm Beach County PDRP contains an action that addresses the provision of short-term children's activities until regular school and child-care facilities are available (EP-29). The county may also want to work with their parks and recreation staff to address access to playgrounds as well as work with any NGO's in the area that may be able to help ensure that the small neighborhood and community ties are not lost after a disaster by possibly scheduling activities and programs for the community to bring them back together. These activities can also serve as an economic boost for communities in need. For example, a fish fry or barbeque offers an opportunity for neighbors to gather as well as a way for the neighborhood to generate funding for small repair or restoration projects needed that would benefit the entire community. In 2010 Galveston decided to celebrate 2-years of recovery following Hurricane Ike by staging a "flash mob" dance in the downtown area to bring the community together and send a positive message of recovery to the nation. For more information see page 92 in the Guidebook.

ENVIRONMENT

Beach and Dune Restoration	Beach and dune restoration has been addressed in the Palm Beach County PDRP through the issue coastal and aquatic restoration. The actions addressing beach and dune restoration include: ▪ Ensure FDEP files/permits are up to date (SE-9)

	▪ Revise beach/dune templates as necessary (SE-10) ▪ Reassess CCCL (SE-12) The county may want to review any current beach renourishment plans as well as the FEMA Public Assistance Program requirements for renourishment projects. Kyla Gatlin, with the Florida Division of Emergency Management may also be a resource for questions concerning beach renourishment and the PA Program Requirements. She can be reached by email at: kyla.gatlin@em.myflorida.com or by phone at (850) 284-9738. For more information see page 95 in the Guidebook.
Environmental Contamination	In addition to the public health concerns mentioned under the health-related pollution section above, environmental contamination has been addressed in the Palm Beach County PDRP through the following actions: ▪ Assess damage to coastal wetland/mangrove habitats (SE-13) ▪ Assess and restore damaged coral reefs (SE-14) ▪ Marine debris clean up (SE-15) ▪ Create surface water cleanup procedure (SE-16) For more information see page 96 in the Guidebook.
Environmental and historical review of temporary sites	The Palm Beach County PDRP includes a couple of actions that would examine temporary sites including: ▪ Vacant Lands Inventory (LG-1) ▪ Determine pre-existing conditions of all Debris Collection sites (LG-12) ▪ Identify potential debris sites in municipalities (LG-14) The county might consider further defining the above actions to include the historical review of temporary housing, debris management or staging sites. In addition, it is likely that the county's debris management plan has been updated in the past 5 years based on the new state/federal guidance and some of these actions may have been accomplished and/or further fleshed out. For more information see page 97 in the Guidebook.
Natural land and habitat restoration	The Palm Beach County PDRP contains actions related to natural habitat restoration in wetlands as well as in forested areas that may be subject to wildfire through increased fuel loads. These actions include: ▪ Assess damage to coastal wetland/mangrove habitats (SE-13) ▪ Assess and restore damaged coral reefs (SE-14) ▪ Marine debris cleanup (SE-15) ▪ Create surface water cleanup procedures (SE-16) ▪ Promote management plans for conservation areas with emphasis on dealing with hurricane debris (SE-18) ▪ Conservation areas damage assessment (SE-19) ▪ Accelerated fuel reduction strategy (SE-20) For more information see page 97 in the Guidebook.
Green Rebuilding	Currently, the Palm Beach County PDRP does not address green rebuilding or incorporating sustainability into the long-term

	redevelopment of the county. However, the Palm Beach County Strategic Economic Development Plan lists sustainability as one of its five strategies to guide future development. Specifically the plan states, “Enhance the natural environment’s sustainability in making the land use/transportation connection and establish alternative energy policies for sustainability of the built and natural environment.” <i>Palm Beach County Strategic Economic Development Plan</i>, March 2007, p. 5. In addition to this the county may also try to find ways to incorporate the “PBC Go Green Initiative” into the long-term recovery process. For more information see page 98 in the Guidebook.
Parks and urban forest restoration	While forest restoration is discussed through wildfire prevention and conservation areas damage assessment, the concept of parks and urban forest restoration has not been addressed. There is a unique opportunity for Palm Beach County specifically to address this issue as an extensive urban reforestation study has been conducted for the county. In fact, this effort was profiled in the national publication, “Planning the Urban Forest: Ecology, Economy and Community Development,” a PAS Report produced by the American Planning Association. DCA is more than happy to send this information to the county if they are interested in using this during their update. For more information see page 99 in the Guidebook.

Implementation

Pre-Disaster

Pre-Disaster Implementation has been addressed through the identification of many actions that should be taken by the county along with approximate timeframes and funding considerations for completing the tasks. While there are timeframes associated with each action, most of them state “Immediate” or “As soon as possible” or “Prior to next hurricane season. It may be helpful for the community to re-evaluate this very extensive list of pre-disaster actions and put actual dates for completion on each of the tasks. This would be a great exercise for each of the Technical Advisory Committees or Working Groups to undertake in order to begin to assess which actions have actually been completed and when other actions may be most appropriate (in the next 6 months, 1 year, 3 years, 5+ years). The TACs may also consider scheduling meetings in advance around the target dates to complete tasks to reassess what has been accomplished and re-evaluate tasks if the group is experiencing challenges with implementation.

In addition to this, the county may want to explore exercising the PDRP in order to get a better idea of how it might function in the post-disaster environment. This often helps communities best identify any gaps in their current plans and actions most effectively.

Post-Disaster

Currently, the Palm Beach County Post-Disaster Redevelopment Plan addresses post-disaster implementation through a series of tools and sub-plans located in Appendix D, including:

- Post-Disaster Visioning and Community Participation Process Guide
- Ideas for Redevelopment Opportunities to use in Post-Disaster Visioning
- Creating Community Redevelopment Centers
- Creating Business Recovery Centers
- Sub-plans located in the Emergency Operations Center
- Common Post-Disaster Funding Sources
- Disaster Organization Contacts

Post-Disaster Implementation is something that fortunately Palm Beach County has not had to face to date. Since the state has not experienced any large-scale disasters since the completion of Post-Disaster Redevelopment Plans, none of our pilots have had the opportunity to implement their plan in the post-disaster environment. Because of the lack of experience in this subject, it is often the section that is the sparsest in all of the current plans, however there is an opportunity to augment this section of the plan. The Florida Division of Emergency Management is currently working with FEMA ESF-14 to begin to find ways to tie local post-disaster redevelopment plans to the Draft National Disaster Recovery Framework. In addition to this, Palm Beach County is currently working on further developing the Recovery Annex of its Comprehensive Emergency Management Plan. Due to both of these activities, Palm Beach County is in a prime position to begin to tie their post-disaster redevelopment plan to their long-term disaster recovery operational strategy. It is recommended that Palm Beach County strengthen both of these plans by tying them together during the update of the PDRP.

Additional Information

In addition to the resources referenced in the above review, more information on post-disaster redevelopment planning can be found on the DCA and DEM websites.

Florida Department of Community Affairs:

<http://www.dca.state.fl.us/fdcp/dcp/PDRP/>

Florida Division of Emergency Management:

<http://www.floridadisaster.org/Recovery/IndividualAssistance/pdredevelopmentplan/>

Also, Department and Division staff are available to assist you as you update your plan. See contact information below:

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PDRP PLAN INTEGRATION ANALYSIS/SEA LEVEL RISE

The PDRP acts as a guide for utilizing the policies and procedures found in other documents when making post-disaster redevelopment decisions.

The objective of the Post Disaster Redevelopment Plan is to guide the redevelopment decision making process following a disaster in a manner consistent with local comprehensive plans (especially the Future Land Use and Coastal Management Elements, where applicable), the Local Mitigation Strategy, the Comprehensive Emergency Management Plan, and other relevant plans or codes such as the Long Range Transportation Plan, land development regulations, floodplain management plans and activities, and economic development and redevelopment plans. Each of these plans, and potentially others, has pre existing policies or procedures that affect post-disaster redevelopment. For instance, the comprehensive plan has many policies that determine where and to what extent redevelopment can occur.

Ultimately, the PDRP acts as a guide for utilizing the policies and procedures found in other documents when making post disaster redevelopment decisions. The planning process provides an opportunity to examine how local plans and codes will impact redevelopment and to recommend changes that could result in a faster and more sustainable recovery.

Implementation of the Post Disaster Redevelopment Plan will overlap with implementation of other plans that also address some of the same topics, such as housing or infrastructure. The focus on long-term post disaster redevelopment, however, is unique to the Plan and its implementation strategy should include specific actions for integrating long-term redevelopment considerations into other local plans, as applicable.

Status and Plans for PDRP Integration with Palm Beach County Plans

Plan integration in Palm Beach County began with development of the County's PDRP in 2005 and 2006. At this writing, language directly acknowledging and linking the PDRP is included in the following County level plans:

- Comprehensive Plan
- Comprehensive Emergency Management Plan
- Unified Local Mitigation Strategy
- Recovery Plan
- Strategic Economic Development Plan

Language recognizing the provisions and objectives of the PDRP is also prevalent in the County's Hazard Specific Plans, Recovery Branch organizational and operational documentation, in documents relevant to the county's participation in the National Flood Insurance Program and Community Rating System, and is integral to the collaborative community resilience, economic redevelopment and disaster recovery initiatives being pursued by the county's Private-Public Partnership.

Plans call for strengthening the integration and coordination language in these plans and expanding integration to other plans and documents which address topics such as growth management, capital planning, social services, environmental stewardship, housing, health emergency plans, continuity of government plans, etc.

The PDRP and Recovery Plan

Palm Beach County's Recovery Plan is an important companion document to the PDRP. It provides organizational and operational guidance for early recovery activities leading up to long-term community recovery, reconstruction and economic redevelopment. The Recovery Plan focuses heavily on activities necessary for reestablishment of essential public health and safety services, restoring interrupted utility and other essential services, reestablishing transportation routes, providing food and shelter for those displaced by the disaster, arranging for immediate assistance, and other priority activities necessary to establishing tolerable, manageable levels of physical, economic, social, and political stability and functionality.

Linkages with the PDRP are cited throughout the Recovery Plan. Pages 7 and 74- 78 of the Concept of Recovery Operations section, in particular, address plan interrelationships and the phased organizational and operational transition processes from short-term recovery to long-term recovery and redevelopment.

Sea Level Rise Integration Project

In the Spring of 2011, the Florida Department of Community Affairs (now Division of Economic Opportunity) and the Florida Division of Emergency Management asked Palm Beach County to be part of a multi-organizational, multi-disciplinary project team charged with developing and testing methodologies for integrating sea level rise adaptation strategies into PDRPs.

At the time, Palm Beach County was actively engaged in revising and enhancing its 2006 PDRP and was (and is) an active community partner in the South East Florida Regional

Climate Change Compact doing state-of-the art research and planning on the subject of sea level rise in southeast Florida. Because of these two concurrent activities the State believed Palm Beach County was uniquely positioned and qualified to be a principal in a sea level rise integration demonstration project.

The product of this work, a model for integrating sea level rise adaption strategies into PDRPs, is described in the balance of this section.

Key players in the project were:

- Florida Division of Economic Opportunity (DEO)
- Calvin, Giordano and Associates (contracted consultant to DEO)
- County members of the S.E. Florida Regional Climate Change Compact
- Palm Beach County Division of Emergency Management

Several departments of the county participated in planning discussions, supplied technical and administrative information and guidance, and were instrumental in reviewing draft documents and maps. A technical and administrative challenge was developing a product which at the same time would realistically meet the needs of the County in addressing sea level rise and serve as a practical actionable model for other communities. As the impacts of sea level rise in Palm Beach County are expected to be somewhat less than in several other coastal communities in the state, a “worst case” scenario was necessary to demonstrate the multiplicity of factors to be considered.

Sea Level Rise Plan Integration: A Pilot Study for Palm Beach County

Following is a special report prepared by the Florida Department of Economic Opportunity as part of Phase V of the State’s Redevelopment Planning Initiative. Released in September 2011 the study identifies and analyzes opportunities for integrating sea level rise adaptation and mitigation language and policies into key plans, policies and procedures of Palm Beach County and its municipalities.

Statewide Post-Disaster Redevelopment Planning Initiative: Phase V
Sea Level Rise Integration: A Pilot Study for Palm Beach County
October 2011

Florida Department of Economic Opportunity

Contents

Chapter Overview	4
Section I: Review of Community Resilience Strategies in Existing Plans	6
Palm Beach County Comprehensive Plan	6
Introduction and Administrative Element	6
Intergovernmental Coordination Element	6
Health and Human Services Element	7
Historic Preservation Element	7
Housing Element	7
Future Land Use Element	7
Transportation Element	8
Utility Element	8
Coastal Management Element	9
Conservation Element	10
National Flood Insurance Program	18
Municipal Comprehensive Plans	10
Palm Beach County Capital Improvement Element (CIE) of the Comprehensive Plan and Capital Improvement Program (CIP)	18
Palm Beach County Post-Disaster Redevelopment Plan	11
Social and Environmental Issues	11
Redevelopment and Mitigation Issues	12
Palm Beach County Local Mitigation Strategy	15
Goals, Objectives, and Benefits	15
Hazard Vulnerability Analysis	15
Flood	16
Hurricanes	16
Beach and Soil Erosion	16
Intergovernmental Coordination	16
Palm Beach County Strategic Economic Development Plan (March 2007)	19
Section II: Recommendations for Future Sea Level Rise Plan Integration	21
Palm Beach County Comprehensive Plan Integration	21
Introduction and Administrative Element Recommendations	21
Comprehensive Plan, Land Use Designations Recommendations	23
Comprehensive Plan Land Acquisition Element Recommendations	27
Comprehensive Plan Transfer of Development Rights Recommendations	28

Comprehensive Plan Housing Element Recommendations	29
Comprehensive Plan, Recreation and Open Space Element Recommendations ..	30
Comprehensive Plan Transportation Element Recommendations	31
Comprehensive Plan, Utility Element Recommendations.....	32
Comprehensive Plan, Coastal Management Element Recommendations.....	34
Health and Human Services Element Recommendations	34
Comprehensive Plan Intergovernmental Coordination Element Recommendations	36
Palm Beach County Capital Improvement Element (CIE) of the Comprehensive Plan and Capital Improvement Program (CIP) Recommendations.....	37
Palm Beach County Post-Disaster Redevelopment Plan Integration	38
Local Mitigation Strategy Integration	39
Local Mitigation Strategy Intergovernmental Coordination Recommendations.....	39
Local Mitigation Strategy Hazard Vulnerability Analysis Recommendations	41
Local Mitigation Strategy, Repetitive Loss Properties Recommendations	42
Local Mitigation Strategy Public Outreach and Education Recommendations	42
Local Mitigation Strategy, Fiscal Impact Recommendations.....	43
Palm Beach County Strategic Economic Development Plan (March 2007).....	44

Sea Level Rise Integration and Community Resilience

Executive Summary

This model case study represents the fifth phase of the Statewide Post-Disaster Redevelopment Planning Initiative. The initial four phases provided vulnerable communities a planning process to guide post-disaster redevelopment activities that enhance community sustainability and ensure resilient redevelopment after a large scale disaster. The purpose of this planning phase is to augment the planning guidance, specifically to vulnerable coastal communities, to also consider the potential impacts of hurricane storm surge augmented by sea level rise within their post-disaster redevelopment efforts. This case study focuses specifically on Palm Beach County, Florida to explore a range of adaptation strategies which may be employed in the post-disaster environment to enhance community sustainability. This case study provides a preliminary assessment of how sea-level-rise predictions may alter the impacts of future storms and provides strategic recommendations for local decision makers to consider in balancing community resilience and long-term community sustainability in the aftermath of a large scale disaster.

Palm Beach County was selected the pilot community for the following reasons:

- Palm Beach County was one of the first communities within the State of Florida to develop a comprehensive Post-Disaster Redevelopment Plan which pre-dated the Statewide Post-disaster Redevelopment Planning Initiative.

- The executive leadership within Palm Beach County demonstrated a strong level of support and understanding of the importance of post-disaster redevelopment planning and community sustainability initiatives.
- Palm Beach County is part of a larger regional effort, the Southeast Florida Regional Climate Change Compact which has devoted extensive research and consensus building effort to document sea level rise scenarios that could be applied to hurricane storm surge vulnerability modeling.
- Without a need to build consensus on the sea level rise scenarios, planning efforts may focus on exploring adaptation strategies and policy options which may be integrate into Post-Disaster Redevelopment Planning efforts.
- Palm Beach County was in the early stages of their Post-Disaster Redevelopment Plan update process so integration was timely.

This planning initiative represents the fifth phase of the Statewide Post-Disaster Redevelopment Planning Initiative sponsored by the Florida Department of Economic Opportunity in partnership with the Florida Division of Emergency Management and the Florida Department of Environmental Protection with funding through grants from the National Oceanic and Atmospheric Administration and the Federal Emergency Management Agency.

Section I: Review of Community Resilience Strategies in Existing Plans

Palm Beach County Comprehensive Plan

The Palm Beach County Comprehensive Plan serves not only as a blueprint for Palm Beach County's future, but also as the County's regulatory policy document. It defines county positions as they relate to development and redevelopment activities. The Comprehensive Plan is comprised of 15 elements. All elements contain policies with a potential influence on sea level rise impacts; however, only the elements with are marked (*) contain strategic components which may impact sea level rise strategies (either intentionally or unintentionally) within their current form and are therefore included in this initial evaluation:

- Introduction and Administrative Element
- Future Land Use*
- Transportation*
- Housing*
- Utility* (includes Water, Sewer, Storm water Management and Solid Waste)
- Recreation and Open Space
- Conservation* (includes Aquifer Recharge)
- Coastal Management*
- Intergovernmental Coordination*
- Capital Improvement*
- Economic Development and Sustainability
- Fire Rescue

- Public Education
- Health and Human Services*
- Library Services
- Historic Preservation*

Introduction and Administrative Element

Within the Comprehensive Plan Definitions of the Introduction and Administrative Element currently sea level rise related issues have not been incorporated.

Intergovernmental Coordination Element

Intergovernmental Coordination element details the coordination and cooperation mechanisms which support the ongoing improvement and maintenance of the plan. In particular Objective 1.3 highlights details related to plan elements and in the future may address the need to incorporate impacts related to sea level rise in the many elements listed above. This element may also incorporate the efforts ongoing by the Southeast Florida Regional Compact in support of these efforts. Palm Beach County signed a memorandum of agreement in XXX to document and validates the support of the Palm Beach County leadership to the strategies and initiatives of the Compact members.

Health and Human Services Element

The Health and Human Services Element addresses the protection of vulnerable populations (Objective 2.1) access to affordable healthcare (Objectives 2.2) and housing (Objective 2.4), as well as, protection of the public against all hazards through planning and preparedness (Objective 4.1). This Element currently does not specifically address the health and human service impacts associated with sea level rise; however, within the broad context of this element, it may be appropriate to ensure that these impacts are incorporated. Various segments of the population including the elderly, economically challenged and mobility impaired persons may encounter personal, cultural, and economic obstacles to understanding and implementing adaptation strategies particularly in the post disaster environment. Consideration of the human impacts will be essential in all phases of strategy development.

Historic Preservation Element

The Historic Preservation Element currently addresses the identification, preservation, and restoration of valuable historic sites and landmarks throughout the County. These sites contribute to the economic viability of the County and represent an important cultural resource. The long-term identification and monitoring of these sites in areas which may be impacted by sea level rise is an important variable to consider when assessing historic preservation.

Housing Element

The Housing Element addresses primarily affordable housing related issues within the community. It also incorporates strategies for relocation of Housing in Objectives 1.3 and Provision of Special Needs Housing in Objective 1.4. The evaluation of long-term

impacts associated with sea level rise may reveal residential areas within the community that are likely to experience increased risks for flood water inundation either due to coastal erosion, rising water levels in open tidal bodies or water, or failing storm water management structures and systems.

Future Land Use Element

The Future Land Use Element's purpose incorporates an understanding of the need to create sustainable communities by stating that the first guiding principle is to "Conserve and protect natural and man-made resources, and restore and maintain key ecosystems to provide adequate supplies of clean and safe water for natural, human and economic systems." (p. 1 – FLUE). This guiding principle could adequately support the integration of sea level adaptation strategies within the existing land use framework for Palm Beach County. The greatest challenge in Palm Beach County, and perhaps most of the south Florida region, is that the most threatened geographic coastal regions are already densely developed. Identifying strategies to protect, accommodate, or retreat/relocate from the most vulnerable areas will invariably create intense political debate, economic challenges, and social upheaval. It is within the Future Land Use Element that many of these factors will be addressed.

Currently there are no specific land use tools in place to address the anticipated impacts of sea level rise. However, numerous policies prohibit activities in the Coastal High Hazard Area, which to some degree overlaps with the adaptation action area. In Policy 2.2.1-a, density increases in the Coastal High Hazard are limited. Objective 2.4 Transfer of Development Rights (TDR) provides a land use management tool which may also be valuable in addressing the impacts of sea level rise. The TDR program is designed to protect Environmentally Sensitive Lands and the Agricultural Reserve by designating these lands as sending areas and redirecting growth to more desirable receiving areas. This program does incorporate the use of TDRs for redirecting the construction, reconstruction or development away for areas vulnerable to sea level rise pre disaster or post disaster.

Objective 5.1 Protection of Natural Resources and Systems currently protects natural resources and systems by enforcing and monitoring existing environmentally related ordinances and developing ordinances, as needed, pursuant to the Conservation Element including the protection and stewardship of natural resources and systems, including quality uplands and wetlands, environmentally sensitive lands, wildlife habitats and regional water management areas (Policy 5.1-a) and high quality coastal and inland wetlands and future potable water supply well field areas (Policy 5.1-b). Policy 5.1-d requires the County to develop regulations and incentives for the use of buffering, or other land management techniques, to ensure compatibility with the function and purpose of conservation lands, and development of those properties adjacent to conservation lands. Currently this objective does not address the potential impacts of sea level rise on these vulnerable coastal wetlands and potential potable water supply.

Transportation Element

The Transportation Element establishes policies to guide the delivery of transportation services, including performance standards, future expansions, marketing, environmental considerations, financial feasibility, plan coordination, and public involvement. The transportation network is identified to maintain adequate service levels to the public based on estimates of future development and population growth. Policy 1.11-b states that the County shall follow the appropriate standards for erosion control for application to County roadways and other transportation systems. While impacts of sea level rise are not specifically stated, the impacts from erosion may be considered within the policy.

Utility Element

The Utility Element addresses policies to maximize the use of existing utility facilities, correct existing deficiencies, promote a more efficient land use pattern, and conserve and protect water resources. Within the Potable Water and Wastewater sub-element primary objective is to protect water resources through the preservation of water resources and water quality, the conservation of potable water and the use of reclaimed water, safe management and disposal of solid and hazardous wastes, and the protection of well fields and prime aquifer recharge areas. This element details a process to identify contaminated private wells and a strategy to address alternative water supplies for these residents. Though not explicitly stated, this process may incorporate private wells contaminated by saltwater intrusion in Objective 1.6a.

Water Conservation Objective 2.1, 2.2, and 3.1 all promotes policies to conserve water quality and quantity through reuse, groundwater protection, and the identification of alternative water supplies. Sea level rise augments the existing pressure to the vulnerable aquifer in South Florida. Palm Beach County has existing policies and programs which support the long-term sustainability of safe drinking water through these policies.

The Storm water Management sub element prescribes levels of projection for storm water system. Objective 1.1 lists the importance of providing protection from flooding and inundation consistent with the severity of the potential threats to health, safety, welfare, and property. This objective also requires the maintenance of storm water runoff rates at levels compatible with safe conveyance capacities of receiving waters. The objectives also allows for the mitigation of degradation of water quality in surface and ground waters. Sea level rise impacts will be simultaneously mitigated through these objectives though the policy jurisdiction in the current analysis or established service levels does not reflect this added threat. Goal 3 of the Storm Water management Sub Element provides additional tools to advance sea level rise adaptation strategies through the promotion of sound management of storm water and surface water to meet the future demands of the environment, urban growth and agriculture. This goals mandates cooperation with the SFWMD and the Special Districts in the identification and assessment of stormwater and surface water problems and the definition of remediation strategies.

Coastal Management Element

The purpose of the Coastal Management Element is to provide for the responsible use and management of coastal resources related to development activities, protection of human life, the limitation of public expenditures in areas subject to natural disaster and protection of wildlife and natural habitat. In Objective 1.2, the plan offers a series of strategies to protect shoreline including the maintenance of a 30 year shoreline protection plan, maintenance of the Coastal Construction Control Line, strategies to encourage beach nourishment, dune restoration, and inlet sand transfer instead of shoreline.

Objective 2.5 links the Coastal Management Element to the Post-Disaster Redevelopment Plan by detailing a number of policies including the following:

- Policy 2.5-b which addresses the reconstruction of non-conforming uses with major damage,
- Policy 2.5-c: which addresses the use of transfers of development rights to relocate populations in highly vulnerable area and maintain these properties as open space.
- Policy 2.5-d: promoting the enforcement of land use, building construction, flood elevation, septic and sanitary sewer, coastal construction setback, and storm water facility regulations in the post disaster environment to mitigate future hazards

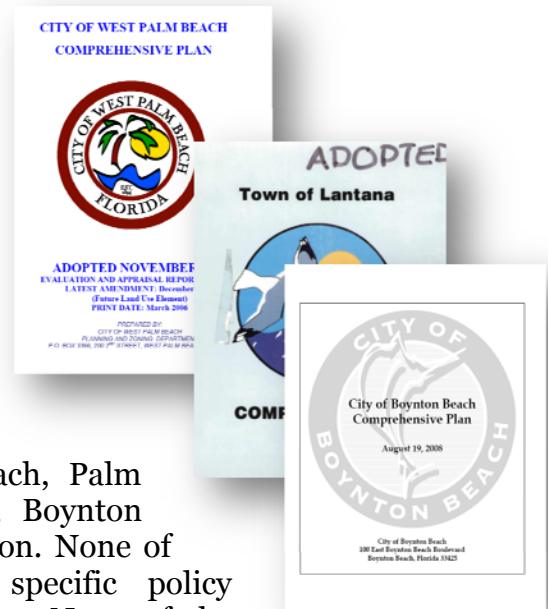
The County through its Coastal Management Element establishes a public policy stating that the County will not subsidize new or expanded development in the coastal area. Further, it is the County's position that population concentrations be directed "away from known or predicted coastal high-hazard areas, and shall discourage increases in population densities that would reduce hurricane evacuation times."

Conservation Element

The Conservation Element contains policies for the protection and preservation of wetlands and conservation areas, air quality, water quality and quantity, estuarine systems, lakes, rivers, native vegetation, and wildlife habitat. This addresses the protection and maintenance of wetlands (Objective 2.2) and water resource quality and quantity (Objective 3.1) The Conservation Element focuses on policies related to protection of the shallow aquifer from contamination, as well as protection of areas around well fields. The element does not incorporate the added challenge of sea level rise within its objectives.

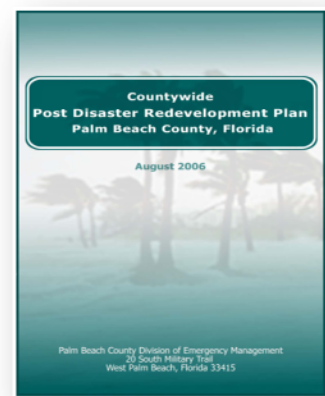
Municipal Comprehensive Plans

The cooperation and coordination of municipal jurisdictions within Palm Beach County in the development and implementation of a sea level rise adaptation strategy is vital to the overall success of the program and implementation in the post-disaster redevelopment environment. The majority of the coastal shoreline and, therefore, sea level rise inundation vulnerable area, is located within municipal boundaries. The study, therefore, conducted an initial survey of the Comprehensive Plans within the fourteen coastal jurisdictions including: Jupiter Inlet Colony, Jupiter, Juno Beach, North Palm Beach, Riviera Beach, West Palm Beach, Palm Beach, Lake Clarke Shores, Lake Worth, Lantana, Boynton Beach, Delray Beach, Highland Beach, and Boca Raton. None of these Comprehensive Plans currently integrate specific policy initiatives related to sea level rise or climate change. None of the jurisdiction has a hazard vulnerability analysis which identifies adaptation action areas and critical facilities and infrastructure potentially vulnerable to sea level rise or increased storm surge inundation areas due to sea level rise. None of the cities have currently incorporated a sea level rise hazard vulnerability analysis or findings of potential vulnerable structures in their Comprehensive Plans. There currently also are not any specific beach and dune erosion /shoreline stabilization strategies which may have been developed specifically in anticipation of sea level rise or increased storm surge inundation areas due to sea level rise. None of the existing land use strategies or land acquisition strategies currently addresses a sea level rise adaptation program.



The City of West Palm Beach Comprehensive Plan (2006) does recognize the fundamental component of “sustainability” and sustainable development in relation to building sustainable neighborhood within the eastern portions of the city, building sustainability and sustainable development initiatives related to transportation and transportation practices. This was the only example of incorporation of sustainability concepts within the Comprehensive Planning framework.

The failure of municipal jurisdictions to address adaptation initiatives within their Comprehensive Plans at this juncture is fully expected since the Southeast Regional Climate Change Compact has not yet formally released their recommendations.



Countywide Post-Disaster Redevelopment Plan

The purpose of this Post-Disaster Redevelopment Plan (PDRP) is to provide Palm Beach County with a single reference for guiding action and decision making during the

disaster recovery period, as well as, detailing actions that can be taken before a disaster strikes to speed the recovery process and build a more sustainable community. While the current PDRP does not specially address the condition of sea level rise, there are numerous policy level issues which impact beach and dune erosion, flooding, hurricanes and groundwater contamination which are the primary hazards impacted by the rising sea level. Following is an examination of these issues both from a policy level perspective, as well, as more detailed implementation actions which are identified in the plan¹

Social and Environmental Issues

According to the Coastal and Aquatic Chapter of Section 2.3 Social and Environmental Issues, Palm Beach County's shores are all classified as "critical" and experience an average annual erosion rates from 2 to 3 feet which is particularly severe along the barrier islands. Coastal storms and hurricanes expedite sand erosion, damage dunes, mangroves and wetlands which, in turn, increase the vulnerability of coastal developments and infrastructure. The Palm Beach County Department of Environmental Resources Management (DERM) manages the re-nourishment, dune restoration, and stabilization initiatives both pre disaster and post disaster. DERM maintains approved designs and upland sand sources for emergency post-disaster deployment. As sea level rises continues to impact coastal erosion, these preparations for responding to erosion may increase in criticality. However, equally important is the evaluation of strategies to create long-term solutions for structures and infrastructure damaged or destroyed by hurricanes. This may create a "window of opportunity" to create larger setbacks, acquire vulnerable lands for open space, or implement a host of other protection, accommodation and retreat strategies identified by the County.

The PDRP Action Plan lists a series of actions which address Coastal and Aquatic Restoration in the aftermath of a disaster including:

SE-9 Ensure FDEP files/permits are up to date: FDEP must have approved beach/dune design templates on file to expedite post-disaster nourishment project approval. Inspections are also necessary for upland sand sources.

SE-10 Revise beach/dune templates as necessary: FDEP approves the design templates for approx. 5 years, but this period can be shortened when severe erosion is experienced.

SE-11 Coordinate with FDEP & USACE to conduct erosion assessment: This is the first step in securing approval and funding to undertake nourishment projects.

¹ At the writing of this document, the PDRP was under revision so the version reviewed for analysis is dated 2006.

SE -12 Reassess CCCL: In a catastrophic, 100-year storm event, the erosion will be so great to warrant reassessing and possibly moving the demarcation landward.

SE-13 Assess damage to coastal wetland/mangrove habitats: Access and document damages to these areas. Inform property owners of need to restore coastal wetland vegetation for hazard mitigation as there may be some property owners who will try to develop damaged areas. Apply for grants to restore these areas.

Redevelopment and Mitigation Issues

Disaster resiliency is also addressed in Sections 2.1 and Section 2.4. These goals stress the importance of institutionalizing hazard resilience and mitigation by directing, modifying and/or limiting Redevelopment in Hazardous Areas (p. 2-18). The PDRP may connect and direct community redevelopment by incorporating the priority mitigation strategies that enhance community resiliency and sustainability. Advance planning and community consensus building will create a supportive environment to advance this goal. Communities may not overlook the valuable opportunity in the post disaster environment to reassess the hazard exposure, vulnerability of commercial structure, residential areas, and public infrastructure. “Allowing redevelopment in areas that have been destroyed without including enhanced mitigation, or at least assessments, puts the burden of paying for disasters on taxpayers who have to assume some of the response and recovery costs from those hazardous development decisions.” (p. 2-18)

The PDRP Action Plan lists a series of actions which address the promotion of redevelopment activities which encourage community resiliency:

RM-18 Expand One-Stop Permitting Centers to include mitigation information: At the existing county building division regional offices which serve as rapid permitting centers after a disaster, also include technical information and expert advice about including mitigation techniques during repairs and rebuilding. Information about financial assistance available for including mitigation and how to find a contractor who can use new mitigation techniques may make it easier for some to include mitigation. Simply being asked prior to permits being processed if they have considered any of the mitigation solutions and pointing them to information on them could be a major influence and help to build a more disaster resistant community.

RM-13 Renew funding for Conservation Land Acquisition Selection Committee (CLASC) purchases: The CLASC could play a role in post-disaster land acquisition if properly funded. Also, selection criteria should be expanded to include mitigation against natural hazards. Acquisition could allow the County to assemble parcels for inclusion in the open space program and it will enable the County to avoid the same amount of destruction in future storm events.

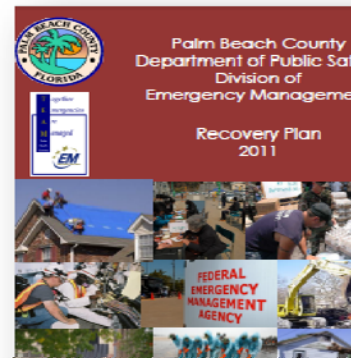
RM-15 Down-zoning undeveloped parcels in hazard-prone areas: Where parcels have not been permitted for development and remain vacant (or where the parcel's existing use is not as high as the allowable use), post disaster down-zoning should be explored as a means to reduce vulnerability to hazards. The post-disaster period provides an opportunity for the County to achieve a valid redevelopment and mitigation initiative.

RM-16 Limiting Redevelopment in Hazardous Areas Initiate municipal cooperation in Transfer of Development Rights program: The county Comprehensive Plan commits to establishing a countywide, multi-jurisdictional TDR program (FLUE, Policy 2.6-p). With the vast majority of coastal properties in municipalities, the County should explore transferring the development rights of damaged coastal properties to the less vulnerable inland locales.

Disaster Recovery Plan

At this writing Palm Beach County's Recovery Plan was under development and not specifically available for inclusion in the sea level rise integration review. However, as a companion document to the PDRP it will be particularly useful during short-term recovery from events brought on by sea level rise.

The Disaster Recovery Annex describes the operational overview and organizational framework employed during the six phases of the Disaster Recovery Process. It details a coordinated system for recovery operations, identifies the operational concepts, and provides an overview of organizational structures which will bridge the gap between the Comprehensive Emergency Management Plan and the PDRP.



The annex addresses policies that are responsive and conducive to an expedited, “all-hazards” disaster recovery process among all stakeholders including public sector agencies and organizations, non-profit and faith-based organizations; municipal and independent districts including water control districts, fire districts, and school districts. The annex will also support recovery of the private sector through economic redevelopment policies.

The goal of the PBC Disaster Recovery Annex is to address policies, procedures, and systems specific to Palm Beach County which govern the immediate recovery environment and include the objectives below:

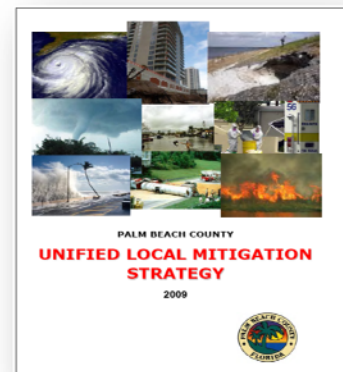
The Disaster Recovery Annex, like the Post-Disaster Redevelopment Plan, will be activated when the disaster impacts are of sufficient magnitude to have widespread impacts throughout the county, including significant property damage, extensive and

prolonged loss of utilities, damage and disruption to vital components of the infrastructure, substantial numbers of businesses unable to reopen, and countywide losses of critical community services.

The Disaster Recovery Annex is not a stand-alone document. Policies and procedures within the Annex have been integrated with a variety of other plans and policies including the Comprehensive Emergency Management Plan, Post-Disaster Redevelopment Plan, the Local Mitigation Strategy, the Disaster Housing Plan, the Economic Redevelopment Plan, and others. In the post-disaster environment, the Disaster Recovery Annex acts as an initial guide for implementing the full range of policies and procedures when making post-disaster recovery decisions. It is, therefore, essential that the Annex links all documents and policies across the various disciplines, programs, and jurisdictions.

Palm Beach County's Unified Local Mitigation Strategy

The purpose of the Local Mitigation Strategy (LMS), which was updated in 2009, is to reduce or eliminate the impact of hazards which exist within a community and are a threat to life and property. Local mitigation planning forms the foundation for short-term and long-term post disaster recovery and mitigation activities and is a required plan for counties seeking funds through mitigation funding opportunities. This plan contains valuable information regarding the potential impact from the most likely hazards, or core hazards.



Goals, Objectives, and Benefits

The goals, objectives and benefits of the LMS are currently addressed in section 2.4.1, 2.4.2, and 2.4.3 and provide the strategic framework for all-hazards mitigation initiatives. The goals focus on reducing the loss of life, property, and repetitive damage; ensuring safe and fiscally sustainable communities; increasing the community rating system score; and promoting awareness and preparedness. While the LMS does not specifically identify goals to mitigate against the impacts of sea level rise, the all-hazards mitigation approach of this plan provides an appropriate and sound foundation for addressing community sustainability and resiliency. No specific changes are recommended to this section.

Hazard Vulnerability Analysis

The LMS provides an overview and detailed hazard vulnerability analysis of the hazards which may impact Palm Beach County in section 3.1. While sea level rise is currently not addressed as an independent hazard category, other identified hazards may anticipate heightened impacts as the condition of sea level rise impacts over. Floods (Section 3.1.1.1), hurricanes (3.1.1.2), and soil and beach erosion (Section 3.1.1.10) may be intensified due to the condition of sea level rise altering the traditional elements of the natural and man building environment.

The Palm Beach County Local Mitigation Strategy was updated in 2009. The existing plan identifies the need to further refine the hazard listing and incorporate sea level rise as stated in Special Appendix I: Expanded Hazard List. The Special Appendix I provides the following definition: “Sea level rise is defined as the long-term increase in mean sea level occurring in response to global climate and local tectonic changes on Page SAI-2.” However, it may be more appropriate to consider sea level rise as an alternate condition affecting the existing list of hazards, not as an independent hazard. The various sections within 3.1 may be updated to reflect the inclusion of sea level rise condition throughout the hazard vulnerability analysis. Sea level rise and increased storm surge inundation areas due to sea level rise are issues that augment the impacts other hazards and may not be considered an independent hazard.

Flood

Section 3.1.1.1 details the conditions under which flooding occurs within the County and provides an overview of historical flooding events. This section states that during intense rainfall events, “streams and drainage ditches may 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 Intracoastal Waterway 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.” (p. 3-7). This condition may likely be exacerbated by sea level rise because flow rates in low lying may be further inhibited. The relations between traditional flood conditions due to severe rain events will be impacted by sea level rise and may be further explored in this section.

Hurricanes

Section 3.1.1.2 addresses the hazard associated with hurricanes. It details the overall vulnerability of the state and region due to its topography. Due to rapid population and economic growth in the last five decades largely along the coast, the potential for property damage and human casualties continues to increase “Florida not only has the most people at risk from hurricanes, but it also has the most coastal property exposed to these storms.” (p. 3-8). Similarly, the condition of a higher sea level will increase the total inundation resulting from the storm surge. This section may incorporate an analysis of the increased impacts created by sea level rise on the hurricane storm surge inundation projections, impacts to lives and properties, as well as, the potential economic impacts and risk compensation factors.

Beach and Soil Erosion

Section 3.1.1.10 address the hazard associated with beach and soil erosion stating that the natural forces of wind, waves, and long shore currents move the natural sand placement and change the beach shape and structure. “Most beaches, if left alone to natural processes, experience natural shoreline retreat.” (p. 3-28). However, this retreat is altered by manmade structures, and creates a perceived need to protect the existing shoreline conditions. This condition will be vastly augmented by the increase of the sea level. Existing homes, businesses, roads, bridges, and other manmade structures will suffer more rapid beach erosion and eventual water intrusion. This section may incorporate an analysis of the increased impacts created by sea level rise.

Intergovernmental Coordination

Section 4.1.5 Intergovernmental Coordination is an essential element of the hazard mitigation process due to the inter-jurisdictional impacts of disasters. This section details a variety of intergovernmental coordination mechanisms which may be employed to raise awareness of changing conditions such as sea level rise.

The Palm Beach County League of Cities is a nonprofit corporation which promotes and advances the collective interest of the municipalities of Palm Beach County, Florida. It seeks to study municipal issues and results through a cooperative effort; to respect the principles of Home Rule; to encourage and enhance the quality of life of the citizens of Palm Beach County; and/or to engage in any other lawful purpose not for pecuniary profit.² This organization plays an important role in the coordination between the County and the thirty-eight municipal jurisdictions within the county.

Furthermore, it may be important to acknowledge the Southeast Florida Regional Climate Change Compact as an additional intergovernmental tool available to the County and the jurisdictions within. The Southeast Florida Regional Climate Change Compact represents a joint commitment of Broward, Miami-Dade, Palm Beach and Monroe Counties to partner in mitigating the causes and adapting to the consequences of climate change. The Compact was formalized following the 2009 Southeast Florida Climate Leadership Summit, when elected officials came together to discuss challenges and strategies for responding to the impacts of climate change. The Compact outlines a collaborative effort to participate in a Regional Climate Team toward the development of a Southeast Florida Regional Climate Change Action Plan. Once released, the recommendations within the Action Plan will form the foundation for policy development. None of the adaptation recommendation included in this case study is designed to conflict or supersede the recommendations of the Southeast Florida Regional Climate Change Action Plan.

Section 4.1.4.2 Municipalities and Appendix B-2 of the Local Mitigation Strategy provide an overview and listing of jurisdictional mitigation initiatives which enhance community resiliency. Many of the projects and policy initiatives listed in these sections are applicable to the impacts of flooding, hurricanes, and beach erosion. The condition of sea level rise may be incorporated in the identification of mitigation projects and

² League of Cities Website: <http://www.leagueofcities.com/about>.

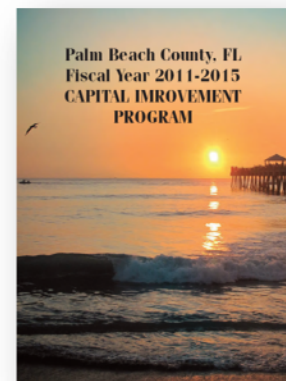
application of hazard specific policies to enhance community sustainability. For example, the City of Boca Raton requires a storm water drainage plan for all new construction and administers an on-going storm water inspection and maintenance program as detailed on as detailed on page B-6. In light of the long-term increase in sea level rise, the City of Boca Raton may choose to also integrate analysis associated with sea level rise during the storm water drainage plan development. The Town of Palm Beach has completed the north-end and mid-town beach re-nourishment projects as detailed on Page B-26. While it is unclear if sea level rise was incorporated in the long-term analysis of the coastal vulnerability, these renourishment projects will have a long-term impact of rising water levels due to sea level rise and the vulnerably coastal shores.

County Capital Improvement Element (CIE) of the Comprehensive Plan and Capital Improvement Program (CIP)

Capital facilities are considered to be any governmental expenditure for the acquisition of land, or the construction and installation of facilities that are expected to be in service over a considerable period of time. Capital projects are relatively large scale, nonrecurring projects that may require multi-year financing. There are six criteria for prioritizing capital improvements in Palm Beach County as detailed in Policy 1.4-a of the Capital Improvement Element. They are as follows:

1. Correct public hazards;
2. Eliminate existing deficiencies as described by the minimum levels of service;
3. Provide capacity for developments that have received a valid Development Order/Permit determination when such developments are within the Urban Service Area;
4. Provide for the renewal and replacement of, and improvement to, existing public infrastructure and physical assets;
5. Maintain levels of service as new growth occurs (note: the County maintains a minimum level of service for transportation, potable water and wastewater, solid waste and storm water management, recreation and open space, and fire rescue, PBC Comprehensive Plan, Page 1 – CI)
6. Increase existing levels of service to desired levels of service; and
7. Implement the Goals, Objectives and Policies of other Plan Elements.

The CIE evaluates the need for public facilities as identified in the individual elements, estimates the cost of improvements, analyzes the fiscal capability of the County to finance and construct the improvements, and provides a schedule for the funding and construction of the improvements. Projected revenues are compared to the projected funding requirements to demonstrate the fiscal feasibility of the Plan. Each municipality has its own Comprehensive Plan, priorities, and capital budget. Where there are greater-than-municipal benefits, the County may participate in the funding of a municipality's capital programming.



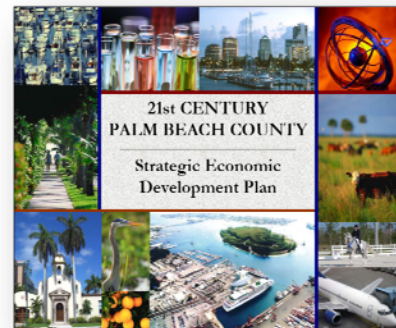
The Capital Improvement Program (CIP) is an estimated schedule of funding necessary to acquire or construct the priority projects and improvements over a six-year period. The initial year reflects the approved capital budget for the current year. In addition to detailing the prioritized projects, the CIP also outlines new funds and capital reserves.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), provides federally backed flood insurance to home and business owners in communities that agree to adopt and enforce comprehensive floodplain management standards. Communities must adopt of land use, zoning and building code standards that, at a minimum, include the design and construction standards of the NFIP. The minimum NFIP program design and construction standards are applicable to all new construction, substantial damages and substantial improvements to existing structures located in Special Flood Hazard Areas or in Special Flood Hazard Areas that have not yet been identified by FEMA. There are a number of building requirements that NFIP requires for new construction or substantial improvements in coastal high hazard areas to be able to withstand wind and waves. New buildings and improvements must:

- Obtain and maintain the elevation of the bottom of the lowest horizontal structural member of the lowest floor.
- Be located landward of mean high tide and no new construction is allowed over water.
- Be elevated so that the bottom of the lowest horizontal structural member of the lowest floor is at or above the base flood elevation (BFE), on a pile or column foundation.
- Allow the space below the lowest elevated floor to be free of obstruction or must be enclosed with non-supporting breakaway walls, open lattice-work, or insect screening designed to collapse under wind and water loads without causing damage to structural supports or the elevated structure.
- Not use fill for structural support buildings.
- Prohibit manmade alteration of sand dunes and mangrove stands that would increase potential flood damage.

The Palm Beach County Local Mitigation Strategy provides an overview of the status of the National Flood Insurance Program and the Community Rating System Status of Activities in Special Appendix III: NFIP and CRS Status and Activities among all jurisdictions. In this appendix the plan details the level of participation from each Palm Beach County jurisdictions, the status of their Florida Insurance Rate Maps, the total number of insurance policies and collected premiums, as well as



the CRS related reductions. It is anticipated that federal policies associated with these programs may seek to incorporate the impacts of sea level rise and potentially affect coastal communities.

Strategic Economic Development Plan (March 2007)

The mission of this plan is to set the framework for future actions and establish economic development priorities through public private partnerships. These partnerships will allow the County to leverage private investment, to attract stakeholders with interest and leadership skills, to support public agencies which will lead the initiatives, and to forge municipal and county relationships to ensure mutual cooperation and benefits. The overall objective is to reinforce the local tax base, generate revenues with minimal increase in public services, build a global entrepreneurial climate, enhance and accent the natural and built environment, highlight arts and culture, generate smart transportation and land uses, affordable housing and learning opportunities, and lastly, create pre-and post-disaster economic systems that respond to our coastal vulnerabilities with vigor. This Strategy clearly identifies strategies with an understanding of the importance of community wide sustainability in the context of social, capital and environmental awareness. The following policies show a linkage to community resilience, the Post-Disaster Redevelopment Plan, and the importance of linking economic development initiatives to these elements:

Page 25, Action I. 07 Develop a resilient and sustainable economy by implementing the PDRP: This Plan encompasses all business preparedness functions and initiatives; promotes improved inter-organizational communication, collaboration, and coordination and offers opportunities to pool resources to strengthen, enhance and expand business preparedness and recovery programs and initiatives. Future business recruitment and business retention depend heavily upon economic survivability during and after disasters. Preliminary discussions are underway to form public/private partnership initiatives that will strengthen business disaster resiliency and survival rates, as well as better utilize local business resources and capabilities in support of community disaster preparedness, and post-disaster recovery and economic redevelopment. Key partners in these discussions are Office Depot, IBM, NCCI, CH2M Hill, Tropical Shipping, Blue Green, the Business Development Board, the Risk and Insurance Managers Society, the Deputy County Administrator, the Director of the Economic Development Office, Director of the Small Business Assistance Office, representatives of Enterprise Florida, Emergency Management's Business and Industry Liaison, the Small Business Development Center, Workforce Alliance, trade and vocational schools, and Chambers of Commerce. In addition, post-disaster redevelopment plans have been adopted by the Palm Beach County Board of County Commissioners and are being implemented. The creation of a full-time Business and Industry Liaison staff position within the Division of Emergency Management is being explored. Finally, it is anticipated that sustainable design concepts (including water and energy efficiency and the development and use of alternative energy sources) may

potentially be considered economically important in the future for policy guidance and subsequent implementation.

Section II: Recommendations for Future Sea Level Rise Plan Integration

Comprehensive Plan Integration

Introduction and Administrative element Recommendations

Within the Comprehensive Plan Definitions of the Introduction and Administrative Element sea level rise related issues have not been incorporated. The plan may include terms associated with the emerging science of global climate change and sea level rise including the sea level rise definition proposed in the Local Mitigation Strategy, and definitions for adaptation action area, protection, accommodation and managed relocation / retreat. This section may also acknowledge sea level rise and community sustainability as emerging concepts being incorporated in the long-term vision of the County.

There is no single department within Palm Beach County that has the responsibility to advocate for sea level rise adaptation strategies and policies in the pre or post disaster environment. Impacted jurisdictions may consider the identification of a primary coordinating agency or organizations that will advocate for the policies and projects that support the sea level rise adaptation strategies among the multitude of internal departments, external agencies, and across impacted jurisdictions within the County. In Palm Beach County, the Department of Environmental Resources Management is responsible for beach and dune erosion projects which often simultaneously affect sea level rise protection strategies. This Department, however, is less engaged in the range of other major infrastructure capital projects which are largely managed by the Department of Engineering and Public Works. This Department is responsible for

Comprehensive Plan Sample Definitions for an Administrative Element

Sea Level Rise

Sea level rise is defined as the long-term increase in mean sea level occurring in response to global climate and local tectonic changes.

(Palm Beach County Local Mitigation Strategy (2009))

Adaptation Action Area

An optional comprehensive plan designation for areas that experience coastal flooding and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning. Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding. Criteria for the adaptation action area may include:

- *Areas below, at, or near mean higher high water*
- *Areas which have a hydrological connection to coastal waters*
- *Areas designated as evacuation zones for storm surge*

Protection

These structural measures decrease the vulnerability of rising seas, such as shoreline armoring or beach re-nourishment, while allowing structures and infrastructure in the area to remain unaltered.

advocating for most large infrastructure maintenance and improvement projects, but may not have the historical experience or internal technical expertise to advocate for the impacts of sea level rise. An agency who will champion the cause of sea level rise related

strategies, policies, and projects, may provide greater effectiveness in the interdepartmental coordination, enhanced awareness among decision makers, and maximize the commitment and allocation of limited public dollars.

The County may also choose to evaluate the need for Adaptation Action Areas. Florida Statutes Chapter 163.3177(6) (g) (10) states that: “At the option of the local government, develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high-tide events, storm surge, flash floods, storm water runoff, and related impacts of sea-level rise. Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge.”

Comprehensive Plan Sample Definitions for an Administrative Element

Accommodation

Accommodation strategies do not act as a barrier, but rather alter the design through measures such as elevation or storm water improvements, to allow the structure or infrastructure system to stay in place. Adaptation measures do not prevent flooding or inundation of the property but do protect the structure.

Retreat

Retreat strategies involve the actual removal of existing development and possible relocation to other areas and the prevention of future development in these high risk areas. Retreat options usually involve the acquisition of vulnerable land for public ownership, but may also include other strategies such as transfer of development rights, purchase of development rights, rolling easements, conservation easements, etc.

Note: This reference has been paraphrased and augmented from the actual Florida Statute Chapter 163.3177(6)(g)(10) detailed in the text.

Comprehensive Plan, Future Land Use Designations Recommendations

In 2010, the University of Florida Conservation Clinic developed a set of model comprehensive plan goals, objectives and policies to address sea level rise adaptation in Florida. They recommend the development of a spatial overlay to identify adaptation action areas and designate appropriate strategies within each of these areas. The recommended zones are protection zone, accommodation zone, and managed relocation/retreat zone. The type and density of use, construction and design standards, as well as, other restrictions permitted within each designated zone may be evaluated by each local community and based on local preferences. The model provides general guidelines which may be adjusted within each community or expanded to incorporate a full range of regulatory tools including setbacks, buffer zones, conditional development and exactions, rebuilding restrictions, subdivision and cluster development, building code and design standards, hard armoring permits, soft armoring permits, and rolling easement or conservation easement statutes.

The model ordinance provides guidelines for the accommodation zone to ensure that existing and new construction can withstand permanent or periodic water inundation. Residential densities within the accommodation zone may be limited. The design guidelines within this zone may promote compact development that maximizes the use of floodways and flood storage.

The model ordinance also provide guidelines for the managed relocation / retreat zones which include a reduction in density and intensity of future land use along unprotected shorelines, and elimination of new investment in public infrastructure. The managed relocation / retreat zones create a good policy opportunity to employ a transferable development rights program which transfers

Comprehensive Plan Sample Policies for a Future Land Use Element and/or Coastal Element

Develop design guidelines that promote compact development and redevelopment that maximizes the use of floodways and flood storage.

Within the managed relocation / retreat zone:

- *Reduce the density and intensity of future land use along unprotected shorelines*
- *Eliminate new investment in public infrastructure likely to be subject to the impacts of sea level rise*
- *Reduce residential land use densities to no more than __ units per acre and commercial structures to __square feet per acre.*
- *Incorporate the managed relocation / retreat overlay into the transferable development rights program*

Require all permits for new development within the managed relocation zone to include a covenant or other real property instrument that runs with the land, that requires the abandonment and removal of structures and fixtures once they are inundated for at least __ months per year, or are no longer habitable as determined by the building official, whichever comes first.

Revise building codes, and land development regulations to discourage new development or post-disaster redevelopment in vulnerable areas and require additional hardening increased resiliency of buildings and infrastructure for new and redevelopment, particularly for those areas within Adaptation Action Areas.

(source: adapted from the Built

densities and intensities outside of the managed relocation / retreat zone. For additional information reference the Transfer of Development Rights program details below.

The Florida Department of Economic Opportunity has also adopted comprehensive plan designation: “adaptation action areas” for areas that experience coastal flooding and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning. Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding. Jurisdictions may benefit by also considering the reconstruction and redevelopment actions that may be taken within these identified action areas post disaster. If, for example, homes, structures, and infrastructure are damaged or destroyed, may they be rebuild to pre-disaster conditions? Communities may consider disasters a “Window of Opportunity” to rebuild stronger, greener, and more resilient communities particularly in the most vulnerable areas. The use of public funds in areas identified as highly vulnerable may also have political implications across the entire community. For example, is the reconstruction of infrastructure within the managed relocation/retreat area a wise investment?

Within the managed relocation / retreat zone, it will also be important to preserve coastal ecosystems that allow the natural shoreline migration processes to continue unimpeded. In these areas the application of shoreline stabilization techniques may be restricted. The post disaster environment may create additional political and community pressure to restore pre-disaster shoreline conditions.

Comprehensive Plan Sample Policies for a Future Land Use Element

The Natural Area Conservation Category may also be employed for the purpose of conserving or protecting natural resources that provide additional shoreline stabilization or create open space to allow for retreating shoreline.

Restoration Areas may be designated areas within the adaptation action areas that include vulnerable lands that may or may not be already developed and could include Coastal High Hazard area and high storm surge areas. Local governments may place priority on the acquisition of land in these areas for restoration, agriculture, or recreational open space.

Growth Areas may be designated outside of the adaptation action area where growth is encouraged due to due to higher topographic elevations and the presence of existing transportation infrastructure. These designated areas may be developed with Urban Design guidelines that address character of urban place and provide a high quality pedestrian experience through landscaping, and the creation of public space.

Decision makers and the public may

understand the implication of post disaster shoreline restoration efforts which may not be a wise long-term investment of public funds and ultimately become futile in the defense against sea level rise impacts.

New development within the managed relocation / retreat zone may perhaps be subject to removal once the natural sea level rise process begins to encroach upon the area. This objective may be achieved by requiring new permits to be accompanied by a covenant or other real property instrument requiring abandonment and removal of structures and fixtures once they are inundated for a specified period of time each year or are no longer habitable as determined by the building official.

There are two existing land use tools which may also be applied to areas and water resource areas currently endangered by rising sea levels. The Future Land Use Element currently has a Revitalization and Redevelopment Overlay as detailed in sub-objective 1.2.3. This designation allows the County to establish the Revitalization and Redevelopment Overlay to identify neighborhoods that are considered distressed so that they may be targeted for comprehensive and coordinated assistance. The County may want to consider utilizing this designation for areas which are highly vulnerable to sea level rise impacts and/or have been designated in the adaptation action area.

The Future Land Use Element in Policy 2.2.7 has Conservation future land use categories which include the following:

1. Natural Areas Conservation (CON): The County shall apply a CON category to natural areas for the purpose of conserving or protecting natural resources or environmental quality. These areas may be used for wildlife management, passive recreation, and environmental restoration/ preservation. The County shall designate lands which contain natural resources that are to be protected, restored, enhanced, and managed, as appropriate, to sustain viable ecosystems and wildlife habitat and natural resources. These natural areas may include site improvements to support uses which are deemed appropriate and consistent with the function of the designated area.

2. Water Resource Area (WRA): The County shall apply a WRA category to areas being used for regional/local water management purposes. Such purposes include but are not limited to: water supply development, flood protection, storm water attenuation, seepage management, wetland enhancement and mitigation, water quality treatment (either passive or alternative technologies as provided in Chapter 373, F.S.), and recharge areas. These areas may include site improvements to support uses as deemed appropriate and consistent with the function of the designated area.

Comprehensive Plan Land Acquisition of
Element Recommendations

Policy 2.2.7-b of the Future Land Use Element allows the County to designate environmentally sensitive lands purchased by the County as Conservation. According to this policy, the County may coordinate with municipalities to designate these acquired environmentally sensitive lands within incorporated areas as Conservation Areas. The County may consider using this tool to support the sea level rise adaptation strategies. In the aftermath of a disaster, structures, infrastructure, and facilities may be severely damaged or destroyed within identified high risk inundation areas. The post-disaster environment may, therefore, offer opportunities to reevaluate the highest risk areas and seek opportunities to rebuild smarter, greener and more resilient communities.

Comprehensive Plan Sample Policies for a
Land Acquisition Element

The County/ City will prioritize land acquisition within the identified vulnerable areas based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration.

Lands purchased by the County/City to support sea level rise adaptation strategies may be designated as conservation or may be integrated into the sea level rise adaptation overlay district designation or adaptation action area designation.

After a large scale disaster, the County/City may reprioritize land acquisition decisions which support the long-term sea level rise adaptation strategy.

Comprehensive Plan Transfer of Development Rights Recommendations

The use of the transfer of development rights tool may be effective, particularly in the aftermath of a major disaster, to redirect reconstruction and redevelopment efforts away from undesirable areas and into more desirable. Objective 2.6 within the Comprehensive's Plan, Transfer of Development Rights (TDR) provides this land use management tool. The TDR program is currently designed to protect Environmentally Sensitive Lands and the Agricultural Reserve by designating these lands as sending areas and redirecting growth to more desirable receiving areas. If the County chooses to implement a sea level rise adaptation strategy which incorporates protection, accommodation, and managed relocation / retreat overlap districts or zones, then the use of TDRs may be incorporated within the concept.

The Post-disaster Redevelopment Plan references the use of TDRs in an effort to redirect development away from highly risk vulnerable areas. The TDR strategy may be evaluated for use in relocating residential and commercial uses within a managed relocation / retreat zone (this assumes that Palm Beach County considers the institutionalization of adaptation zones within their Future Land Use Element as described above in the Land Use section of this narrative). Coordination and cooperation among the coastal jurisdictions may be valuable in an effort to comprehensively implement the TDR strategy.

Comprehensive Plan Sample Policies for a Future Land Use Element

The managed relocation zone as designated in the future land use map is recognized as a sending area due to the vulnerable nature of these areas and public benefit derived from relocating structures, facilities, and persons out of the highest risk sea level rise inundation zone or Adaptation Action Area.

Comprehensive Plan Housing Element Recommendations

A failure to recognize the long-term effects of sea level rise impacts may create areas of coastal blight. If coastal erosion is gradual, desirable properties and neighborhoods may erode with exposed abandoned homes standing on the beach, piles of rubble in front of homes that remain occupied, and failing coastal waterfronts. Further rapid changes may result, if hurricanes destroy homes and further erode coastal infrastructure and homes. Communities can be severely disrupted by the sudden absence of neighbors who previously contributed to the local economy and sense of community.

As the impacts of sea level rise are better understood and the communities focus mitigation efforts to combat these impacts, then threatened homes, businesses, and infrastructure may be protected. However, if retreat strategies become necessary then county and municipal housing agencies may seek cooperative strategies to protect threatened populations. A variety of strategies may be evaluated for each area. The population in low income areas, persons with special needs, and elderly persons may require additional community support in adjusting to sea level rise adaptation.

Comprehensive Plan Sample Policies for a Housing Element

Working with the community, evaluate residential areas with the various adaption zones to determine a timeline for action, identify areas which may require additional assistance, and develop strategies to support the long-term implementation of the adaptation strategy.

Capital improvements, infrastructure restoration and expansion within the high risk areas may be reviewed to determine the extent to which the proposed improvement is appropriate for the long-term sea-level rise adaptation zone in which it is located, and whether it will contribute to additional development within the vulnerable area.

Comprehensive Plan, Recreation and Open Space Element Recommendations

Within this element, it will be important to recognize the role that open space may have within the identified adaptation strategies. These recommendations tie closely to the recommendations detailed for the Land Acquisition Element. Local jurisdictions may consider assessing existing and future publically owned parks and recreational facilities that are located within the vulnerable areas in order to accommodate appropriate uses or to support retreat adaptation strategies. There may also be funding opportunities to support the acquisition, enhancement, or expansion of these public owned lands or facilities in order to provide green space or designate passive recreation uses.

Comprehensive Plan Sample Policies for a Recreation and Open Space Element

Evaluate the existing parks and recreation facilities within the adaptation action area to ensure parks are sufficiently hardened to withstand potential impacts from erosion over the life expectancy of the facilities.

Evaluate the use of future parks and open space to support the long-term adaptation strategy within the community.

Lands purchased by the County/City to support sea level rise adaptation strategies may be designated as conservation or may be integrated into the sea level rise adaptation overlay district designation or adaptation action area designation.

After a large scale disaster, the County/City may reprioritize land acquisition decisions which support the long-term sea level rise adaptation strategy and consider utilizing these lands in support of recreational and water dependent uses.

Comprehensive Plan Transportation Element Recommendations

In order to ensure that the existing and future transportation infrastructure is sufficiently resistant to the effects of sea level rise and supports the overall adaptation strategy, jurisdictions may consider additional policies which would enhance the utilizations of the Transportation Element as a tool in achieve sea level rise adaptation. Existing city, county, state, and federally owned, managed, and funded transportation infrastructure could be evaluated to determine the short-term and long-term anticipated impacts. Communities may want to prioritize and develop specific assessment criteria to evaluate the critical components of the transportation system including roads, bridges, public transport, airports, and ports. All transportation infrastructures within the adaptation area may ultimately be sufficiently hardened to withstand potential impacts from erosion over the life expectancy of the infrastructure systems. During the long-term planning process, it may also be beneficial for communities to consider the appropriate uses within the adaptation action areas. Providing specific designations for these vulnerable areas such as overlay districts may reinforce the consideration of these impacts over time.

Comprehensive Plan Sample Policies for a Transportation Element

Evaluate the existing transportation infrastructure within the adaptation action area to ensure systems are sufficiently hardened to withstand potential impacts from erosion over the life expectancy of the infrastructure.

Ensure that planned transportation infrastructure within the adaptation action area is appropriate within the projected range of sea level rise and meets the greater community sustainability goals and is appropriate within the identified overlay district.

Comprehensive Plan, Utility Element Recommendations

Post-disaster utility restoration will face numerous challenges as decision makers incorporate a vision of enhanced community resiliency throughout the redevelopment process. Sea level rise represents significant long-term challenges to the water supply and storm-water management systems. Rising ground water elevations combined with rising sea levels will create drainage and flood control obstacles that cannot be resolved by any one entity or jurisdiction. Each jurisdiction must continue to evaluate these impacts on the built environment and identify actions to build long-term resiliency. The recommendations posed by the Southeast Regional Climate Change Compact may ultimately be incorporated into the Comprehensive Plan's Utility Element to support the community's adaptation strategy. After a disaster, numerous "Windows of Opportunity" may become available to rapidly advance the adaptation strategies which have been identified locally to meet community needs. Post-disaster redevelopment may ensure that infrastructure and utility reconstruction post disaster meet the higher standards as prioritized by the jurisdiction and potentially redirect redevelopment within the highest risk areas which have been designated my local communities.

This element also details a process to identify contaminated private wells and a strategy to address alternative water supplies for these residents. In the post-disaster environment, this process may be directed in the detection of saltwater intrusion in private wells (Objective 1.6a) which could be become a challenge as the sea level rises and storm surge inundates vulnerable areas.

Comprehensive Plan Sample Policies for a Utility Element

Evaluate the impacts of rising sea and groundwater levels on soil storage, infiltration rates and inflow to storm water and wastewater collection and conveyance systems; consider longer-term influences on water quality; and develop strategies for implementing reclaimed water and storm water reuse projects that account for current and future conditions

Develop Integrated Water Management Plans that present a joint assessment and planning strategy involving local water utilities, wastewater service providers, water managers, and partners to the Southeast Florida Regional Climate Change Compact, for coordinated consideration of storm water use and disposal, traditional and alternative water supplies, wastewater disposal and reuse, and water conservation measures for use by local leadership to guide planning decisions as well as amendments to applicable codes and regulations.

Identify potential sites for use in providing storm water storage and mechanisms to increase aquifer recharge as a means for managing saltwater intrusion and enhancing water supplies.

Identify and pursue adaptation strategies to improve drainage and flood control in areas designated as "Adaptation Action Areas" and where changing hydrologic conditions are anticipated to impact surface water management

(Source: adapted from the Draft Built Environment Work Group, Focal Areas and Strategies)

The Storm Water Management sub element Objective 1.1 states that the protection from flooding may be consistent with the severity of the public health and safety threats. It is unclear if the impacts on the storm water system are currently well enough understood to develop specific mitigation actions to address sea level rise. The storm water systems have extensive inter connectivity within the greater floodplains. In order to maintain storm water runoff rates levels compatible with safe conveyance capacities of receiving waters it will be necessary to perform more detailed hydrological evaluation of the storm water management system. The Southeast Regional Climate Change Compact continues to provide guidance and policy recommendations for local jurisdictions. Additionally, the post-disaster environment may provide opportunities to not only advance knowledge of impacts of storm surge and sea level rise on ground water and storm water management systems, but also create opportunity to rapidly advance adaptation goals.

Comprehensive Plan Sample Policies for a Utility Element

Evaluate the existing utility infrastructure within the adaptation action area and potentially exposed to the impacts of sea level rise. Ensure utility systems are capable of withstanding potential impacts from erosion, flood inundation, saltwater intrusion and other sources of challenges over the life expectancy of the utility infrastructure components.

Evaluate the impact of sea level rise on the ability of the gravity flow storm water system to continue to maintain conveyance capacity.

Ensure that planned utility infrastructure within the adaptation action area is appropriate within the projected range of sea level rise and meets the greater community sustainability goals and is appropriate within the identified overlay district.

Consider policies that would limit capital improvements with the appropriate overlay districts

Incorporate and prioritize preferred improvement projects in capital improvement plans and pursue funding.

(Source: adapted from the Draft Built Environment Work Group, Focal Areas and Strategies)

Comprehensive Plan, Coastal Management Element Recommendations

The Coastal Management Element Objective 1.2 offers a series of strategies to protect shoreline including the maintenance of a 30 year shoreline protection plan, maintenance of the Coastal Construction Control Line, strategies to encourage beach nourishment, dune restoration, and inlet sand transfer instead of shoreline.

The County through its Coastal Management Element establishes a public policy stating that the County will not subsidize new or expanded development in the coastal area. Further, it is the County's position that population concentrations be directed "away from known or predicted coastal high-hazard areas, and shall discourage increases in population densities that would reduce hurricane evacuation times." This policy, by default, will have the effect of also affecting much of the sea level rise inundation area since they overlap. In areas where they do not overlap, an analysis may be conducted to determine the cause. Consideration may be given to expand this policy in all appropriate areas of the adaptation action areas.

Health and Human Services Element Recommendations

The Health and Human Services Element may analyze the potential for drinking water contamination caused by saltwater intrusion. As saline ocean waters continue to create increasing pressure on the sensitive ground water supply, saltwater can infiltrate the sensitive aquifer. Similarly, the surface water supplies could also be impacted by rising sea levels due to the inability of the vast interconnected preserves, lakes, and canals to

Comprehensive Plan Sample Policies for a Coastal Management Element

Identify areas of the built coastal environment vulnerable to sea level rise where shoreline stabilization strategies may be appropriate.

Within the Shoreline Protection Plan incorporate a feasibility analysis to protect economic investment, public and private infrastructure.

Inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the Sea Level Rise planning horizon.

Inventory all public buildings and infrastructure that are vulnerable to sea level rise and determine whether they can be protected through shoreline stabilization.

Compensate for the loss of ecosystem services resulting from hard shoreline stabilization in the County through the construction of living shorelines in front of hard shoreline stabilization structures where it is feasible do so.

operate within a gravity flow. Without an adequate supply of safe drinking water, South Florida will quickly reach sustainability crises.

Public safety may also be threatened in vulnerable flood prone areas due to long-term increasing threat of flood waters. Sea level rise impacts are not likely to occur rapidly but instead create a gradual long-term condition threat to a multitude of community elements. However, even moderate increases in sea level, could exacerbate storm surge inundation in the aftermath of a hurricane and storm water runoff capability after prolonged rain events. Vulnerable areas may be identified and monitored to anticipate escalating vulnerabilities over time.

Comprehensive Plan Sample Policies for a Coastal Management Element

Facilitate coastal ecosystem migration through the maintenance and restoration

Comprehensive Plan Sample Policies for an Intergovernmental Coordination Element

The County/City is signatory to the Compact and recognizes the emerging threat posed by the rising sea level. In order to ensure long-term coordination of efforts toward community resiliency, we recognize the efforts of the Compact as detailed in the Climate Change Action plan and will coordinate and integrate sustainability strategies throughout the Comprehensive plan to benefit the residents of the County/City.

Comprehensive Plan Intergovernmental

Coordination Element Recommendations

Section 4.1.5 d. Special Coordination Needs of the Comprehensive Plan identifies the Intergovernmental Coordination mechanisms guiding specialized components of the comprehensive planning process. As data and policy objectives become refined, it will be necessary to ensure countywide and regional coordination among all organizations, departments, and jurisdictions engaged in policy development focused on climate change, sea level rise, and community sustainability. Communities may consider evaluating the need to integrate the coordination processes detailed in the Intergovernmental Coordination Element of the Comprehensive Plan, the Southeast Florida Regional Climate Change Compact, the PDRP, and the Local Mitigation Strategy to ensure post disaster goals, objectives, and strategies comprehensive address community resilience concepts. The joint policy position and Climate Change Action Plan will detail the strategies for sea level rise adaptation and incorporate climate preparation concerns for the regional economy, regional infrastructure, the built environment, social and cultural needs, and natural systems. (Southeast Florida Regional Climate Change Compact, adopted December 15, 2009). A large scale disaster may provide opportunities to expedite these goals.

Capital Improvement Element (CIE) of the Comprehensive Plan and Capital Improvement Program (CIP) Recommendations

The CIP outlines the budget and implementation plan for the construction, enhancement, or maintenance of infrastructure and facilities countywide to support the levels of service as defined in the County's Comprehensive Plan. The CIP identifies the major public infrastructure investments to guide the County's physical development and provides a systematic plan for improvements within a prioritized framework.

In Palm Beach County, the project identification process for inclusion in the CIP, originates at the departmental level. For example, the Department of Engineering and Public Works may submit capital storm water enhancement and roadway improvement projects. The Facilities Development and Operations Department may submit land acquisition projects among others. The Parks Department may also advocate for land acquisitions to expand, enhance or protect parks. Some of these parks may be located in the flood inundation areas and, therefore, inadvertently also benefit sea level rise adaptation goals. Current capital projects may either directly or indirectly advance community resilience goals and mitigate the impacts of sea level rise. Communities may consider opportunities within the CIP project identification process to verify that all projects maximize impacts to community resilience and at a minimum consider the long-term implication of sea level rise. This evaluation and coordination may cross both departmental lines and maximize opportunities for inter-jurisdictional coordination and cost sharing.

Post-Disaster Redevelopment Plan Integration

The post-disaster redevelopment environment provides the County an opportunity to implement the adaptation strategies and redevelopment policies of the Comprehensive Plan, the Local Mitigation Strategy, the Climate Action Plan, and numerous other local plans and policies. This critical time period is an opportunity to address and mediate social and political obstacles to achieving more aggressive community sustainability goals. Palm Beach County's sea level vulnerable areas are largely developed and comprise the tourism center of the County vital to economic viability. The large commercial developments along the shoreline will protect their investments and resist regulatory actions promoting adaptation. After a large hurricane, the effects of sea level rise will be apparent creating greater erosion and damage to structures and infrastructure. The political commitment to implement key adaptation strategies will become vital including:

- Permitting reconstruction and redevelopment in compliance with the identified overlay zones detailed in the Future Land Use Element.
- Enforcing requirements of the National Flood Insurance Program.
- Limiting the investment of public funds into public facilities and infrastructure with the identified overlay zones.
- Discouraging shoreline protection strategies in opposition to the overlay zones
- Taking advantage of land acquisition opportunities which may become apparent in the aftermath of a disaster to create open space

Post-Disaster Redevelopment Plan Sample Policies:

The PDRP Steering Committee is committed to implementing the sea level rise adaptation strategies identified in the Comprehensive Plan and the Local Mitigation Strategy.

The PDRP Steering Committee will identify, evaluate, and guide the implementation of actions post disaster that will further community sustainability goals including promoting land acquisitions to expand open space within appropriate overlay zones, discouraging inappropriate shoreline protection, and closely monitoring the dedication of public funds within the overlay zones.

Local Mitigation Strategy Integration

Local Mitigation Strategy Intergovernmental Coordination Recommendations

As data and policy objectives for Palm Beach County's approach to sea level rise become refined, it will be necessary to ensure countywide and regional coordination among all organizations, departments, and jurisdictions engaged in policy development focused on climate change, sea level rise, and community sustainability. The Southeast Florida Regional Climate Change Compact has been established and authorized to develop a joint policy position that includes specific recommendations regarding the allocation of federal climate change funding and to develop a Southeast Florida Regional Climate Change Action Plan. The Action Plan may include strategies for the coordinated regional preparation for and adaptation to a rapidly changing global environment based upon regional mapping of projected sea-level rise and any resulting amplification of localized impacts of tropical cyclone events. Such strategies may incorporate climate preparation concerns for the regional economy, regional infrastructure and the built environment, social and cultural needs, and natural systems. (Southeast Florida Regional Climate Change Compact, adopted December 15, 2009). Additional coordination efforts may be necessary between the Compact and the Local Mitigation Strategy Steering Committee and the Post-Disaster Redevelopment Steering Committee to ensure pre and post disaster integration of policies.

Local Mitigation Strategy Sample Policies

*Add to the list of Ad Hoc Committees:
Sea Level Rise Integration – and/or*

The Local Mitigation Strategy Steering Committee recognizes the emerging threat posed by the rising sea level as detailed in the Hazard Vulnerability Analysis. In order to ensure long-term coordination of efforts toward community resiliency, we recognize the efforts of the Compact as detailed in the Climate Change Action Plan and appoint a liaison to coordinate and integrate sustainability strategies.

The Local Mitigation Strategy currently has a defined organizational structure responsible for the maintenance and implementation of the strategy. The organization consists of a Steering Committee and numerous committees. In order to integrate the activities of both Committees, the LMS membership may consider identifying a method of coordination with the Southeast Florida Regional Climate Change Compact and its' strategy recommendations either through a standing LMS Working Committee or a Committee Liaisons. The findings of the Climate Change Plan once developed will affect numerous components of the Local Mitigation Strategy, the Post-Disaster Redevelopment Plan, and the Comprehensive Plan. Following is a list of policy areas which may need to be revised based upon the recommendations of the Climate Change Plan:

Local Mitigation Strategy Hazard Vulnerability Analysis Recommendations

The hazard vulnerability analysis forms the foundation for policy recommendations and strategic actions in the Local Mitigation Strategy, the Post-Disaster Redevelopment Plan, and the Comprehensive Plan. Sea level rise may not be considered a hazard, but rather a condition created by a number of global variables. This condition will have an impact on a variety of other threats including inland flooding magnified by inadequate storm water management systems, coastal erosion produced by wave action and amplified by coastal storms, and groundwater contamination due to saltwater intrusion. While many variables remain unknown on the interrelationship of sea level rise and other global factors, experts agree that the sea levels are rising.

Local Mitigation Strategy Sample Policies Flooding

The impacts of sea level rise have been incorporated in the evaluation of short and long-term risk analysis which is posed by severe rainfall and flooding in the City/County. A summary of the hazard vulnerability analysis has been identified in Map XX. For additional information related to the cause of the flooding see Section XX.

Local Mitigation Strategy Sample Policies for Section 3.1.1.2 Hurricanes

The impacts of global climate change and sea level rise will have an impact on the frequency and intensity of tropical storm activity. These long-term impacts remain under scientific scrutiny. The City/County has assessed the potential impacts of sea level rise during the hazard vulnerability analysis of hurricanes. For additional information related to the impacts see Section XXX and Map XX.

Local Mitigation Strategy Sample Policies for Section 3.1.1.10

The impacts of sea level rise will impact ongoing beach and dune erosion, as well as, erosion in the aftermath of a disaster. The most vulnerable properties may be evaluated for long-term adaptation strategies including protection, accommodation, or retreat. For additional information related to the impacts see Section XXX.

Local Mitigation Strategy, Repetitive Loss Properties Recommendations

In order to gain additional credit through the Community Rating System, each member of the community must evaluate and take action to mitigate the repeated losses of repetitive loss and severely repetitive loss structures. In Palm Beach County and annual evaluation of these properties is conducted in order to identify strategic mitigation opportunities. Based upon the exact hydrological reasons for flooding in these areas, repetitive loss properties may be more significantly impacted in the future as sea level rise augments the storm water drainage capabilities. The storm water systems are based on the ability of headwater pressure to exceed gravity flow. Sea level rise problems could have a more immediate impact on properties that already are experiencing repetitive losses and historical problematic areas.

Local Mitigation Strategy public Outreach and Education Recommendations

The local mitigation strategy member organizations address and implement a range of all hazards public outreach and education programs. These programs are designed to meet requirements associated with the National Flood Insurance Program, and specifically, the Community Rating System guidelines and have a heavy focus on flood mitigation. The focus of the outreach activities under the guidance of the Local Mitigation Strategy, however, could be expanded to support public awareness of sea level rise and community resilience in the future due to the extensive overlap of required expertise, emphasis on mitigation opportunities.

Local Mitigation Strategy Sample Policies for Repetitive Loss

Repetitive loss properties and historically flood prone areas will also be evaluated annually to determine increase of risk posed by sea level rise. The analysis may include a review of the storm water management system within the floodplain, any flood mitigation which may have occurred in the area to alleviate future flood potential, and recommendation for additional flood management strategies to reduce flood potential for these repetitive loss properties.

Local Mitigation Strategy Sample policies for public Outreach and Education

The Local Mitigation Strategy Steering Committee and its members remain dedicated to continuing public outreach and education efforts to promote community awareness of the range of hazards impacting their community including, flooding and hurricanes. As new conditions threaten to alter the potential impacts of these disasters, the committee will place renewed emphasis to incorporate this information such as sea level rise and associated adaptation strategies. The committee may target residential communities and business districts within the adaptation action areas to participate in setting adaption policy.

Local Mitigation Strategy, Fiscal Impact Recommendations

The Local Mitigation Strategy contains a series of hazard related loss estimates for each jurisdiction. Sea level rise is likely to have an impact on these loss estimates. During the next update, the financial impacts associated with flooding, hurricanes, and beach erosion may consider incorporate sea level rise impacts.

The Local Mitigation Strategy (2009) lists and ranks a total of eighty-three priority mitigation projects. Development, maintenance, and ranking on this prioritized project list is essential to receive funding consideration under various state and federal mitigation funding programs. As the County and the municipal jurisdictions within begin to incorporate the potential of sea level rise as a component of their community resiliency strategy, it may be beneficial to also consider if the listed priority projects may be evaluated against their ability to impact long-term sea level rise impacts. The list may also want to solicit the inclusion of additional project submissions which are considered priority mitigation projects to address sea level rise in the future. In many cases mitigation projects which address coastal flooding, coastal erosion, storm-water management, habitat preservation and drinking water protection may simultaneously address sea level rise.

The following project categories which are listed in Appendix E of the Palm Beach County Local Mitigation Strategy may be reevaluated for sea level rise impacts including:

- Storm water infrastructure enhancement projects including culvert improvements and expanded drainage system

Local Mitigation Strategy Sample Policies for the Priority Project List

Incorporate an evaluation of projects which mitigate against the impact of sea level rise and contribute to long-term community resiliency and sustainability

- Storm water engineering studies and hydrology studies
- Land acquisition projects benefitting storm-water management, environmentally sensitive habitats, and additional green space
- Beach re-nourishment projects, seawall restoration, and other coastal shoring projects
- Elevation of roadways near the potential inundation areas such as the proposed A1A elevation in Manalapan

Combining the evaluation of all hazards impacts to the prioritized projects may provide an additional means for categorizing projects and maximizing inclusion for a variety of funding opportunities. Once the impacts of sea level rise become visible to communities around the nation, policy and funding priorities are likely to place a greater significance on the need to mitigate these impacts. This may open the door to unanticipated funding streams for sea level rise mitigation and increase the importance of pre-identifying these projects.

Strategic Economic Development Plan (March 2007)

The Strategic Economic Development Plan currently recognizes the importance of integrating economic development strategies with the Post-Disaster Redevelopment Plan. This plan has also framed its economic development strategies within the context of long-term community resilience. As Palm Beach County continues to refine long-term sea level rise adaptation strategies, it will be vital to continue to coordinate these efforts with the private sector partners who may experience threats to the tourism industry and the host of dependent and interrelated economic sectors within south Florida.

Attachment A: Model Sea Level Rise Adaptation Comprehensive Plan Language

In 2010 the University of Florida Conservation Clinic developed a set of model comprehensive plan goals, objectives and policies to address sea level rise adaptation in Florida. The following model language is intended to be a starting-off point for communities that are looking to adopt language in their comprehensive plan to address sea level rise. It is expected that the language would be modified to meet the specific needs of the community or that only the appropriate language would be included.

GOAL 1: DEVELOP THE TEMPORAL AND SPATIAL CONTEXT FOR SEA-LEVEL RISE ADAPTATION PLANNING IN THE CITY/COUNTY.

Objective 1.1 – Spatial Overlay: Identify the areas of the City that are vulnerable to level rise where the protection, accommodation, and retreat strategies should be used.

- o **Policy 1.1.1:** The City/County shall use data and analysis to establish a SLR adaptation overlay district encompassing all areas within the City that are vulnerable to SLR consisting of three coastal zones.
 - SLR Adaptation Overlay Protection Zone
 - SLR Adaptation Overlay Accommodation Zone
 - SLR Adaptation Overlay Managed Relocation Zone
- o **Policy 1.1.2:** The City/County shall use data and analysis to establish a SLR adaptation overlay district encompassing all areas within the City that are vulnerable to SLR consisting of three coastal zones.
 - SLR Adaptation Overlay Protection Zone
 - SLR Adaptation Overlay Accommodation Zone
 - SLR Adaptation Overlay Managed Relocation Zone

Objective 1.2 – Temporal: Expand planning horizons for sea-level rise adaptation to capture the anticipated impacts of SLR based on current SLR models.

- o **Policy 1.2.1:** Utilize a (TBD) year planning horizon when considering the adoption of any protection, accommodation, and managed retreat strategy within the City/County.

Objective 1.3 – Sea Level Rise Ready: Ensure that consideration has been given to whether existing and planned public and private infrastructure and land development within the vulnerable area is “sea-level rise ready.”

- o **Policy 1.3.1:** The City/County shall inventory all existing and planned infrastructure and land development within the vulnerable area for its capacity to accommodate projected sea-level rise over the life expectancy of the infrastructure and development.
- o **Policy 1.3.2:** No capital improvements within the vulnerable area shall be financed or constructed without having first been reviewed to determine

the extent to which the proposed improvement is sea-level rise-ready, taking into account the sea-level rise adaptation zone in which it is located, and whether it will contribute to additional development within the vulnerable area.

GOAL 2: TO ENSURE ADEQUATE PROTECTION OF THE BUILT ENVIRONMENT THROUGH SOFT AND HARD SHORELINE STABILIZATION THAT SEEKS TO MAINTAIN A STATIC SHORELINE POSITION WITHIN THE CITY/COUNTY.

Objective 2.1 – Inventory: Identify areas of the built environment vulnerable to sea level rise where shoreline stabilization strategies will be appropriate.

- o **Policy 2.1.1:** [Protection Strategy] The City/County shall develop a comprehensive shoreline stabilization strategy to address protection of the built environment where it has been determined to be feasible and in the best interest of the City/County to protect economic investment and public and private infrastructure.
- o **Policy 2.1.2:** Based on projected rates of sea level rise within the SLR planning horizon the City shall inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.
- o **Policy 2.1.3:** The City/County shall inventory all public buildings and infrastructure that are vulnerable to sea level rise within the SLR planning horizon and determine whether such buildings and structures should be protected through shoreline stabilization.

Objective 2.2 – Mitigation: Compensate for the loss of ecosystem services resulting from hard shoreline stabilization in the City/County.

- o **Policy 2.2.1:** The City/County shall require adequate mitigation for shoreline stabilization through the construction of living shorelines in front of hard shoreline stabilization structures where it is feasible do so.

Objective 3.1 – Built Environment: Assure that all aspects of the built environment within the accommodation zone can withstand additional permanent or periodic inundation based on sea level rise projections through structural and non-structural solutions.

- o **Policy 3.1.1:** The City/County shall require all new construction within the Accommodation Zone to adhere to performance standards designed to enable development to withstand permanent and/or temporary inundation due to rising sea levels.

Objective 3.2 – Land Use: To reduce the density and intensity of development and redevelopment in the accommodation zone landward of unprotected shorelines.

- o Policy 3.2.1: The City/County shall limit the residential density within the accommodation zone to no more than (TBD) units per acre.
- o Policy 3.2.2: The City/County shall develop design guidelines that promote compact development and redevelopment that maximizes the use of floodways and flood storage within the zone of accommodation.
- o Policy 3.2.3: The City/County shall limit the building footprint for all new residential structures within the accommodation zone to (TBD) square feet and commercial structures to (TBD) square feet.

Objective 3.3 -- The Natural Environment: To facilitate coastal ecosystem migration through the maintenance and restoration of adequate open space within the zone of accommodation.

- o Policy 3.3.1: The City/County shall establish riparian buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced water bodies. Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones (transitional zones) where ecologically feasible.
- o Policy 3.3.2: The City/County shall develop priority areas for land acquisition based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration.

GOAL 4: TO REDUCE VULNERABILITY IN THE BUILT ENVIRONMENT AND PRESERVE COASTAL ECOSYSTEMS THROUGH CHANGES IN LAND USE AND THE ORDERLY ABANDONMENT AND /OR LANDWARD RELOCATION OF STRUCTURES AND ASSOCIATED INFRASTRUCTURE

Objective 4.1 – Land Use: Reduce the density and intensity of future land use along unprotected shorelines within the managed relocation zone.

- o Policy 4.1.1: Within the managed relocation zone, the City/County shall eliminate new investment in public infrastructure likely to be subject to the impacts of sea level rise within the planning horizon.
- o Policy 4.1.2: Within the managed relocation zone the City/County shall reduce residential land use densities to no more than (TBD) units per acre and commercial structures to (TBD) square feet per acre.
- o Policy 4.1.3: The City/County shall create a transferable development rights program within the managed relocation overlay that transfers densities and intensities outside of the managed relocation zone.

Objective 4.2 – Shoreline Migration: Preserve coastal ecosystems by ensuring that natural shoreline migration processes may continue unimpeded.

- o Policy 4.2.1: The City/County shall prohibit hard shoreline stabilization techniques within Managed Relocation Zone.
- o Policy 4.2.2: All permits for new development within the managed relocation zone shall include, as a condition of development approval, a covenant or other real property instrument that runs with the land, that

requires the abandonment and removal of structures and fixtures once they are inundated for at least (TBD) months per year, or are no longer habitable as determined by the building official, whichever comes first.

Objective 4.3 – Land Acquisition: Develop programs to encourage abandonment of undeveloped properties and relocation of existing structures within the “Managed Relocation Zone” consistent with projected rates of shoreline recession over the SLR planning horizon.

- o Policy 4.3.1: The City/County shall prioritize and seek to acquire properties or interests in properties within the managed relocation zone based on their relative vulnerability to SLR and the extent to which they may impede coastal ecosystem migration.
- o Policy 4.3.3: The City/County shall promote the acquisition of rolling conservation easements within the managed relocation zone.

PDRP MAINTENANCE/UPDATING

Maintenance and updating of the PDRP is coordinated by the Recovery Section of the Division of Emergency Management in coordination with the PDRP working groups, under the guidance of the PDRP Executive Committee. As the PDRP is well established, maintenance, updating and revisions should be simple and straight forward without unnecessary administrative burden.

Updating and Revision Process

The Update and Revision Process for the PDRP will be a two-part procedure:

1. A significant reassessment and rewrite will be undertaken every 5 years and
2. A smaller review and update will occur annually prior to the beginning of the hurricane season.

In both cases, the PDRP Executive Committee will rely upon the issue-specific expertise of the Working Groups for insight on particular aspects of the plan. Palm Beach County’s Division of Emergency Management staff, particularly the Senior Mitigation Planner, will provide administrative and technical support during both update processes.

Annual Review of the PDRP

Each Working Group should evaluate the actions falling under its supervision annually and provide the Executive Committee with a status report of any pre-disaster initiatives accomplished or started, as well as a list of the pre-disaster actions it plans to tackle during the next year. In addition, the Working Group should solicit input for new actions to be added to the Plan and include these in the status report. The Working Groups may also wish to address any needs for new members and tentatively assign staff to work on post disaster actions in the event of a disaster happening that year.

During the annual review, the Executive Committee will meet late in the calendar year to discuss the Working Groups status reports, address any membership or leadership changes, and discuss increasing municipal involvement in the PDRP, if needed. Following this meeting, as appropriate, the Committee Chairperson(s) and County's Senior Mitigation Planner should prepare a brief PDRP status report. The report should also be distributed to the municipalities.

Five-year PDRP Revision

On a five-year cycle, the entire plan should be reviewed for its functionality, taking into consideration any new experiences in post disaster recovery and redevelopment in Palm Beach County or other locations. Any changes to relevant plans and policies should be noted and reported. Every issue and corresponding action in the PDRP should be analyzed to ensure each task appropriately addresses the current state of affairs in Palm Beach County. Working Groups should be involved in brainstorming sessions to discover if there are any new issues or actions that should be added to the Plan. The County Senior Mitigation Planner should research new post disaster literature for additions and/or revisions to the Plan. Public input can be solicited through a public meeting or via the internet for revisions and ideas for new issues and actions. Assuming annual reviews were done thoroughly and revisions made to the PDRP Action Plan each year, the 5-year major revision should be a manageable process for the PDRP Executive Committee and supporting staff to complete in just a few months. The County Senior Mitigation Planner, in his role as lead staff liaison to the PDRP Committee, will be responsible for compiling draft revisions.

Re-adoption of the PDRP by the Board of County Commissioners and municipalities should only be necessary where major policy, political, operational or administrative changes are made or where a reaffirmation is warranted based on the passage of time or significant organizational changes... The Executive Committee will make the determination on whether and when re-adoption is necessary.

Continuation of the PDRP Committee and Working Groups

The PDRP Executive Committee membership should be renewed annually to assure an effective continuation of the plan. Where the defined department head is unable to serve or participate in certain meetings, a designee with appropriate decision making authority should serve as an empowered delegate. Despite non-participation, the department head retains responsibility for decisions and actions taken by their delegate.

The Senior Mitigation Planner with the County Division of Emergency Management shall serve as lead staff representative to the Committee. He or she will be charged with coordinating and documenting Committee member changes and maintaining an annual meeting schedule for Executive Committee members in accordance with plan revisions and updates.

The Working Groups should also be involved in the revision and updating process. Just as implementation of the plan is more efficient divided among the Working Groups, the

revision process will be more thorough by allowing these specific bodies to evaluate their focus areas. Once the Mitigation Planner has reconvened the PDRP Committee, it shall be the Working Group Chairperson's responsibility to coordinate Working Group meetings. The Mitigation Planner should attend meetings as possible and otherwise check with the Working Group Chairs to make sure their groups are on track.

Documenting Plan Changes

Routine updates and revisions to the PDRP will be compiled and posted to the official online PDRP document by the Division of Emergency Management, with a notation of the changes. Holders of hard copies of the PDRP are responsible for keeping their plans up to date. As an economy measure and to ensure everyone has access to the latest plan updates, PDRP users are responsible for monitoring online postings and printing their own hard copies as needed. An electronic master will be secured at the EOC at all times.

PDRP EXECUTIVE COMMITTEE & INVITEES

(4-19-11)

County Department Representatives

Verdenia Baker, Deputy County Administrator (Co-Chair)
Lorenzo Aghemo, Director, Planning Division
Barbara Alterman, Executive Director, Planning, Zoning, & Building
Jimmy Beno, Deputy Director, Facilities Development & Operations
Steve Jerauld, Palm Beach County Fire Chief
Rebecca Caldwell, Director, Building Division
Edward Lowery, Director, Housing & Community Development
Sherry Howard, Director, Office of Economic Development
Kathleen Scarlett, Director, Purchasing
Bill Johnson, Director, Division of Emergency Management
Claudia Tuck, Director, Division of Human Services
Richard Walesky, Director, Environmental Resource Management
George Webb, Director, County Engineer

Countywide Organization Representatives

Marc Bruner, Director Planning & Environmental Programs, Solid Waste Authority
Roger Amidon, Executive Director, Tourism Development Council
Mary Russell, Hospital Program Mgr., Div. Emergency Medical Services, DOH
Joseph Sanches, Chief of Facilities, Palm Beach County School Board
Tom Serio, Manager Business Continuity/Disaster Recovery, Verizon Wireless
Rick Murrell, Retired Chairman, Tropical Shipping
Kelly Smallridge, President, Business Development Board
Richard Radcliffe, Executive Director, Palm Beach County League of Cities
Randy Whitfield, Director, Palm Beach MPO
Jennifer Beckman, Director, Disaster Recovery Coalition
Kate Boer, Emergency Programs Coordinator, Treasure Coast Regional Planning Council

Municipal Representatives

Nicole Gasparri, Boca Raton
Peter Bergel, Palm Beach Gardens
Jay Boodheshwar, Palm Beach
Lomax Harrelle, Belle Glade
Frank Spence, Loxahatchee Groves

PDRP Working Group Chairs

Land Use

Lorenzo Aghemo, Director, Planning Division

Infrastructure/Public Facilities

George Webb, County Engineer

Jimmy Beno, Director, Facilities Operations

Housing

Edward Lowery, Director Housing & Community Development

Health & Social Services

Claudia Tuck, Director Human Services Division

Jennifer Beckman, Executive Director, Disaster Recovery Coalition

Al Grasso, Emergency Preparedness Coordinator, PBC Health Department

Environmental Restoration

Richard Walesky, Director, Environmental Resources Management

Public Outreach

Lisa Del La Rionda, Director, Public Affairs Department

Economic Redevelopment

Sherry Howard, Deputy Director, Department of Economic Sustainability

Governance & Financial Administration

Verdenia Baker, Deputy County Administrator

Richard Lavarone,, Director Office of Financial Management & Budget

Florida State PDRP Focus Group Members

Appelson	Gary	Caribbean Conservation Corporation
Austin	Mitchell	City of Punta Gorda
Bielling	Jeff	Alachua County
Blackshear	Pat	Blackshear Planning Inc. - Walton Co.
Cahill	Maria	FDOT/ Growth Management
Cox	Liefke	Enterprise Florida
Deyle	Dr. Bob	Florida State University - DURP
Donnelly	David	EM Director, Alachua County
Esnard	Dr Ann-Margaret	Florida Atlantic University
Glassman	Howard	FDOT / Florida MPO Advisory Council
Hahn	Daniel	Santa Rosa County EM
Henry	Gene	Hillsborough County
Johnson	Betti	Tampa Bay Regional Planning Council
Lanier	Sandy	FL DEM
LeBeau	Joan	Chief Planner, City of Punta Gorda
Magee	Alex	FL Section, American Planning Assoc.
Meyer	Sandy	FL DEM
Palmer	Cindy	FEMA Headquarters
Poole	Eric	FL Association of Counties
Quinn	Jim	FDEP
Ruppert	Thomas	Florida Sea Grant
Stiller	Heidi	NOAA
Truesdale	Butch	Palm Beach County EM
Valente	Mickie	Valente Strategic Advisers
Vigo	Gabriela	FEMA Region IV
Westmoreland	Carol	FL League of Cities
Wilson	John	EM Director, Lee County

Pilot Contacts

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Mills-Gutcher	Allara	Panama City
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APPENDICES

Appendix 1 - Post Disaster Visioning and Community Participation Process Guide

In the event some areas may have suffered concentrated destruction to a degree that major redevelopment of that sector of the community is necessary. Rather than allow this redevelopment to happen piecemeal or, even worse, let the area remain in a prolonged neglected state, a transparent visioning process with community participation could result in an opportunity to make the impacted area better than before. The following process outlines some important steps in involving the residents and businesses of an impacted area in decisions for the future during what could be a difficult recovery period. The appropriate PDRP Working Group to oversee each action is cited.

Determining areas that may need a visioning process for redevelopment

- Based on damage assessments GIS can be used to determine if there are areas of concentrated substantial damage. These areas may result from storm surge, excessive flooding, tornadoes, or simply high winds in relation to a hurricane or could be an area impacted by a catastrophic urban/ wildfire or other type of hazard capable of large paths of destruction.
- If a sector of the community with substantial damage to a majority of structures is identified, the appropriate County or city staff should create maps showing the boundaries of the area and the damage it sustained, the future land use for the area, and what the existing uses were. All of this should be available as GIS layers depending on the jurisdiction. If the area of impact is large it should be split into neighborhood units to better enable community participation during the visioning process.
- This information should be taken to the PDRP Executive Committee with the recommendation of the planning staff of the jurisdiction as to whether this area is in need of a visioning process before redevelopment is allowed. If the Executive Committee decides that it should go through a visioning process then the Executive Committee Chair(s) should get approval from the Board of County Commissioners or if the area is in a municipality they should recommend this action to the city council.
- The area should also be given an extended moratorium to allow time to prepare for a visioning process and make any needed land use or regulation changes before rebuilding begins there.
- Once a sector has been approved for a post disaster visioning process, a press release of the County or city's intentions should be prepared that includes a description of the area and asks for residents and businesses from that area to participate. The visioning process can be conducted via a. resource center, website, meetings, etc... The communication should note that the process is not intended to keep people from returning to their neighborhoods and that their right to return is a priority.

Gathering Input and Preparing for a Charette

- Several PDRP actions in this PDRP recommend the creation of regional public information/resource centers throughout the County in the aftermath of a major or catastrophic disaster. These centers may serve several purposes such as disaster financial assistance, temporary housing assistance, mitigation and rebuilding information, and permitting assistance once the moratorium for that area has been lifted. For any area declared for visioning, a resource center should be located there that has information on the visioning process and timeline. Maps, such as those cited above, should be displayed and staff or volunteers should be able to answer questions and record comments. Questionnaires, comment sheets, and maps with markers should be out for interested persons to submit ideas or concerns. Information at the resource center should be available in languages appropriate for the demographics of the impacted area.
- A website should be created with the same information available at the resource center and a means by which people can submit comments as well as a phone number for questions. This will provide a way for those citizens who have not returned to the County to begin participating.
- Analyze the risk of rebuilding (by parcel if possible) and make recommendations if mitigation through current standards will prevent a repeat of the destruction or if some areas of the sector are inappropriate for the current future land use designation. Present these findings to the Executive Committee, and after reaching consensus, make available to the public as a technical report to be used in the charette discussions.
- Perform a brief economic analysis of the impacted community as it was before the disaster and determine if there may be substantial changes due to the disaster. Should the area focus economic development in a different direction? Draft a technical report with recommendations to be used in a charette.
- Stakeholder meetings can be scheduled to focus on the above technical reports and gather public input on how these recommendations could be incorporated into redevelopment plans. These meetings should be facilitated and invite all stakeholders who have returned (residents, businesses, schools, religious institutions, homeowner associations, etc). Media involvement in these meetings should be encouraged to provide information for those who were unable to attend. Proceedings should also be posted on the website.
- Based on public input and technical reports, visual vision alternatives should be prepared for the impact area that can be debated at the charette. Assistance from experts should be enlisted in preparing these alternative visions. The Treasure Coast Regional Planning Council, Florida Department of Community Affairs, professors and their students from Florida graduate planning and/or urban design departments, American Planning Association, and Urban Land Institute are just a few places where expertise could be obtained. The alternative visions should try to incorporate some of the relevant redevelopment opportunities listed in the next section.

Holding a Charette

- Once there has been enough time for displaced persons to return and general input from the public has been developed into alternative visions, a charette can be scheduled for the impacted area. It should be held in a large meeting space as near the area as possible with appropriate audio-visual equipment. The time and date should be chosen to allow as many to participate as possible. During the day on Saturday may be appropriate if there are still safety issues from the hurricane with travel at night. The scheduled charette should be announced in a press release and advertised through signs in the affected area for several weeks prior.
- Professional facilitation services should be procured (could be a pre-disaster agreement) if staff expertise is not available. The visioning charette should create a picture of redevelopment goals for the next 20 or more years. It should be sensitive to private property rights and the possibility of citizen distrust in the process.

Implementing the Vision

- Once a vision has been accepted by the charette attendees, or if necessary a series of charettes, any necessary Comprehensive Plan amendments or Land Development Code changes that would be required to implement the vision should be drafted and reviewed by the legal department in an expedited manner. These should be presented to the Board of County Commissioners, or municipal equivalent where applicable.
- After local approval has been obtained, expedited review and approval by the State should be requested so that the moratorium on this area can be lifted and rebuilding can begin in a managed manner.

Ideas for Redevelopment Opportunities in Post Disaster Visioning

If major redevelopment were necessary following a disaster, an ideal redevelopment project might include some of the following components:

Open space

- Use hazardous land (i.e. surge/flood risk) for open space uses. These areas could be used for parks, habitat conservation, or simply aesthetic public spaces to enhance the new development.
- Natural drainage areas, beach dunes, and wetlands could be preserved or restored while development is clustered elsewhere. Transfer of development rights or land acquisition programs can be used to compensate landowners.

Mixed-uses

- Redevelopment can turn previous single-use areas into vibrant mixed-use neighborhoods. By mixing commercial with residential, residents can cut the amount of automobile trips and enjoy the healthy convenience of walking to the corner store, café, or perhaps their office.

Mixed-incomes

- Redevelopment projects should provide housing options for mixed-income populations. Including workforce housing helps correct the jobs-housing balance within our community. It also helps to ensure that those displaced by the disaster can afford to return to Palm Beach County.

Alternative transportation designs

- Transit and pedestrian oriented developments use human-scale designs rather than catering to automobile needs. Smaller streets and parking lots, continuous bike lanes/paths, and plentiful sidewalks with access to mass transit encourage healthy lifestyles and reduce pollution and energy consumption.

Safe and green buildings

- Environmentally friendly buildings cut energy consumption by providing natural lighting and other innovative solutions such as green roofs. Combining these innovations with hazard mitigation techniques would result in ideal structures- capable of withstanding hurricanes while also conserving natural resources.

Appendix 2 - PDRP Draft Ordinance

WHEREAS, Palm Beach County and its thirty-eight municipal jurisdictions are susceptible and vulnerable to a range of natural, man-made and technological disasters capable of causing extreme harm to people and substantial damage to property, the economy, and the environment, and

WHEREAS, Palm Beach County recognizes that community recovery and redevelopment following major or catastrophic disasters can be extremely prolonged, complex and highly stressful processes, and

WHEREAS, Palm Beach County recognizes that pre-disaster planning of post disaster long-term recovery and redevelopment can significantly enhance community preparedness and resilience and contribute to a more rapid, efficient, and orderly recovery, and

WHEREAS, Palm Beach County, in 2006, in accordance with Section 9J-5 Florida Administrative Code, prepared and adopted a highly acclaimed, pioneering PDRP, and

WHEREAS, significant lessons have been learned subsequently from disaster experiences and PDRPning initiatives around the State of Florida, and

WHEREAS, Palm Beach County desires that its plan be optimally useful, up to date, and reflect best practices, and

WHEREAS, Palm Beach County successfully secured federal grant funding to help revise and enhance its PDRP

NOW, THEREFORE, BE IT RESOLVED, that the Palm Beach County Board of County Commissioners in a meeting this XX day of XXX:

1. Adopt the revised 2013 Palm Beach County PDRP
2. Distribute the PDRP to the County's thirty-eight municipal jurisdictions for adoption.