

## Formally assess natural hazard exposure and vulnerability in the future land use element

The *FLUM* includes a suitability analysis of existing vacant or undeveloped land (§9J-5.006(2)(b), *F.A.C.*), however, this may not assess the constraints posed by natural hazards. As noted above, comprehensive plans must include an analysis is required of proposed development and redevelopment of flood prone areas, and in coastal communities, an analysis of the effects of future land uses on areas subject to coastal flooding.

It is far more effective to consider the constraints posed by all relevant natural hazards as part of the land suitability analysis that serves as an input to developing the *FLUM* and to identify any special land development policies that should be targeted during development or redevelopment of specific areas.

### Process

The following steps are recommended for incorporating hazards assessment information and analyses into the development of the *FLUM* and the *FLUE* policies:

1. **Develop explicit criteria for evaluating alternatives.** These should be based on the goals and objectives of the *FLUE* as well as the other elements of the *Comprehensive Plan*.

2. **Create alternative future land use scenarios.** One approach to defining options is to examine alternative land use scenarios in which one or a few criteria are maximized at the expense of others.
3. **Assess the effects of each alternative.** This is the most challenging part of the process. It requires the ability to predict the effects of different future land use scenarios on population growth and the local economy as well as natural resources and levels of service for public facilities and infrastructure. Methods for assessing the impacts on hazards vulnerability are described below in Section 3.4.
4. **Select the optimal scenario that maximizes achievement of desired goals and objectives while minimizing costs and other undesirable impacts.**

### Applications

If such a hazard identification and vulnerability assessment is done in the process of developing or revising the *FLUM* and *FLUE* policies, the results can be used to determine which of the land use planning and development management practices described in Sections 5.4 and 5.5 will be most effective in reducing the community's vulnerability, including the following.

- Adopting building code standards more stringent than the minima required under the Florida Building Code.

- Establishing hazardous area overlay zones within which
  - **land use types and/or intensities should be regulated through zoning or purchase-and-sellback or lease-back strategies and managed through capital facilities expenditure policies to avoid subsidizing development in hazardous areas;**
- cluster development should be required to avoid hazards through subdivision and planned unit development regulations and/or encouraged through incentive zoning;
  - **development should be set back from hazard zones;**
  - **development densities should be reduced through purchase or transfer of development rights;**
  - **development should be precluded through fee-simple acquisition or transfer of development rights; and/or**
  - **site design regulations and performance standards should be used to minimize off-site flooding and generation of landscape debris.**

A hazard identification and vulnerability assessment as part of the *FLUE*, coupled with an inventory of natural protective features in the *conservation element* of the *Comprehensive Plan*, will provide the necessary information to identify where the protection, restoration, or enhancement of natural drainage features, floodplains, wetlands, or beach and dune

systems will be most critical to minimizing community vulnerability and where it will be most effective to employ specific tools such as the following for doing so (see Section 3.4).

- Define overlay zones within which:
  - **land use types and/or intensities should be regulated through zoning or purchase-and-sellback or leaseback strategies to minimize impacts on natural protective features;**
  - **cluster development should be required through subdivision and planned unit development regulations and/or encouraged through incentive zoning to avoid destruction or disturbance of natural protective features;**
  - **development should be set back from natural protective features;**
  - **development densities should be reduced through purchase or transfer of development rights;**
  - **development should be precluded through fee-simple acquisition or transfer of development rights;**
  - **site design regulations and performance standards should be used to minimize damage to natural protective features; and/or**
  - **tax incentives should be used to encourage protection of natural protective features.**
- Identify natural protective features for which it will be cost-effective to invest

public resources in restoration and/or enhancement.

### **Analyze the effects of future land use on evacuation and sheltering**

The *coastal management element* of the *Comprehensive Plans* shall include an analysis of the impacts of the anticipated population density associated with the future land use policies and *FLUM* (§9J-5.012(2)(e)(1), *F.A.C.*).

Rather than assessing such impacts **after** developing the *FLUM*, these analyses should be performed as part of the process of assessing **alternative** future land use scenarios **prior to** formalizing the *FLUM*. Simple “abbreviated transportation models” or ATMs are now available from DEM that can be used to easily perform such analyses (see Sidebar 3.4).

Results of such analyses will also provide essential input into deciding what strategies to follow where projected evacuation clearance times and/or shelter demands are anticipated to be excessive. These include implementing capital expenditure programs to expand evacuation routes and shelter capacities (see Section 5.2) and using development and redevelopment management tools such as zoning, fee-simple acquisition, purchase of development rights, transfer of development rights, and capital expenditure policies to maintain or reduce population densities within the community’s hurricane vulnerability zone (see Section 5.5).



## Section 3.2: Establish a Central Data Repository

Sharing data between agencies and organizations in the community should not be a one-time occurrence. It is important that current and consistent hazards assessment information be incorporated into each plan during the regular review and update processes (see Section 4.3), and that it be readily available in each planning process. The best practice is to establish a central repository that can acquire, maintain, and provide access to relevant hazard assessment information for all concerned parties.

The local agency that provides technical support for the **LMS** might be a good location for the repository. This is typically the county emergency management agency or the local planning agency. However, because much of the state-of-the-art data are now in geographic information systems (GIS) format, it is important that the central data repository be capable of managing and disseminating such data to all parties.

In smaller jurisdictions, it may not be feasible to have technical staff in both the emergency management and planning agencies who are capable of conducting hazard vulnerability and risk assessment analyses with the available hazard data. In such cases, it will be important that the staff with those analytic capabilities be involved in planning and decision making processes where such analyses are needed (see the discussion of collaboration in Section 4.2).

In larger jurisdictions, there may be equivalent data repositories and analytic capabilities in multiple local agencies. In such cases, more sophisticated means of coordination and collaboration may be needed to assure that each agency has access to current and consistent information.

## Section 3.3: Use Hazard Assessment in Developing the PDRP

One key part of the **PDRP** is a well thought out plan for community redevelopment in the wake of a natural disaster. Vulnerability assessment can be used to determine areas that are the most likely candidates for redevelopment under disaster scenarios of different magnitudes. The **PDRP** should contain pre-defined damage thresholds that specify when areas should be redeveloped for different land use densities and intensities, rather than being reconstructed to previous conditions.

Simple hazard identification only allows identification of areas subject to the forces of hazards of a given magnitude, e.g., a 100-year flood or flooding from a category 3 hurricane. If the community has a database that contains information on the first-floor elevations of residential and commercial structures and public facilities, it is possible to predict the percent damage to individual structures from flooding if flood elevation data also are available. Analytic models are available that can provide

such vulnerability assessment information if adequate local data are available (see Section 3.4). A community may choose to use a percent damage threshold as the basis for determining when redevelopment should occur, e.g., 50 percent of market or replacement value, or it may choose to focus redevelopment in areas with repetitive damage. In the latter case, it also will be necessary to have a database of structures that have previously been damaged.

## Section 3.4: Take Advantage of Available Hazard Assessment Resources

A number of hazard assessment information and analysis resources are available to local governments in Florida for assessing coastal storm hazards and associated flooding. These are briefly summarized here within five categories: (1) hazard identification information; (2) vulnerability assessment information; (3) vulnerability assessment analysis; (4) risk analysis; and (5) hurricane evacuation and shelter demand analysis.

### Hazard identification information

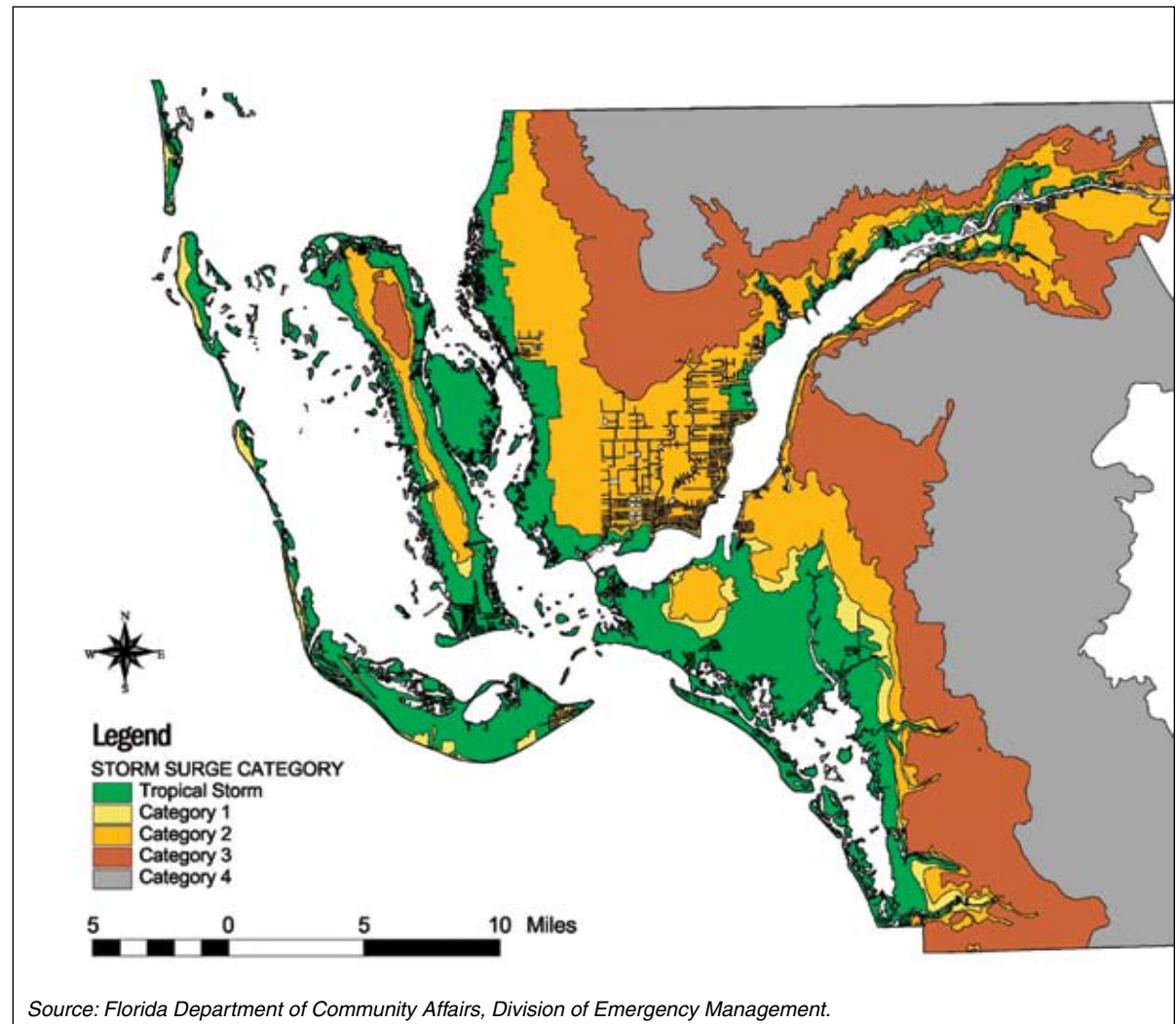
The purpose of hazard identification is to identify areas that are exposed to natural hazards of different magnitudes. Information is available to Florida communities for defining areas subject to coastal flooding, wave impacts and inland flooding, and wind hazards.

### Coastal flooding

Coastal flooding associated with tropical storms and hurricanes is the result of storm surge, water (not waves) that is pushed toward the shore by the force of the storm winds. Storm surge inundation zone data are available from two sources based on two different models for predicting storm surge flooding: (1) SLOSH surge maps developed in conjunction with the preparation of regional hurricane evacuation studies, and (2) TAOS surge maps provided to Florida counties.

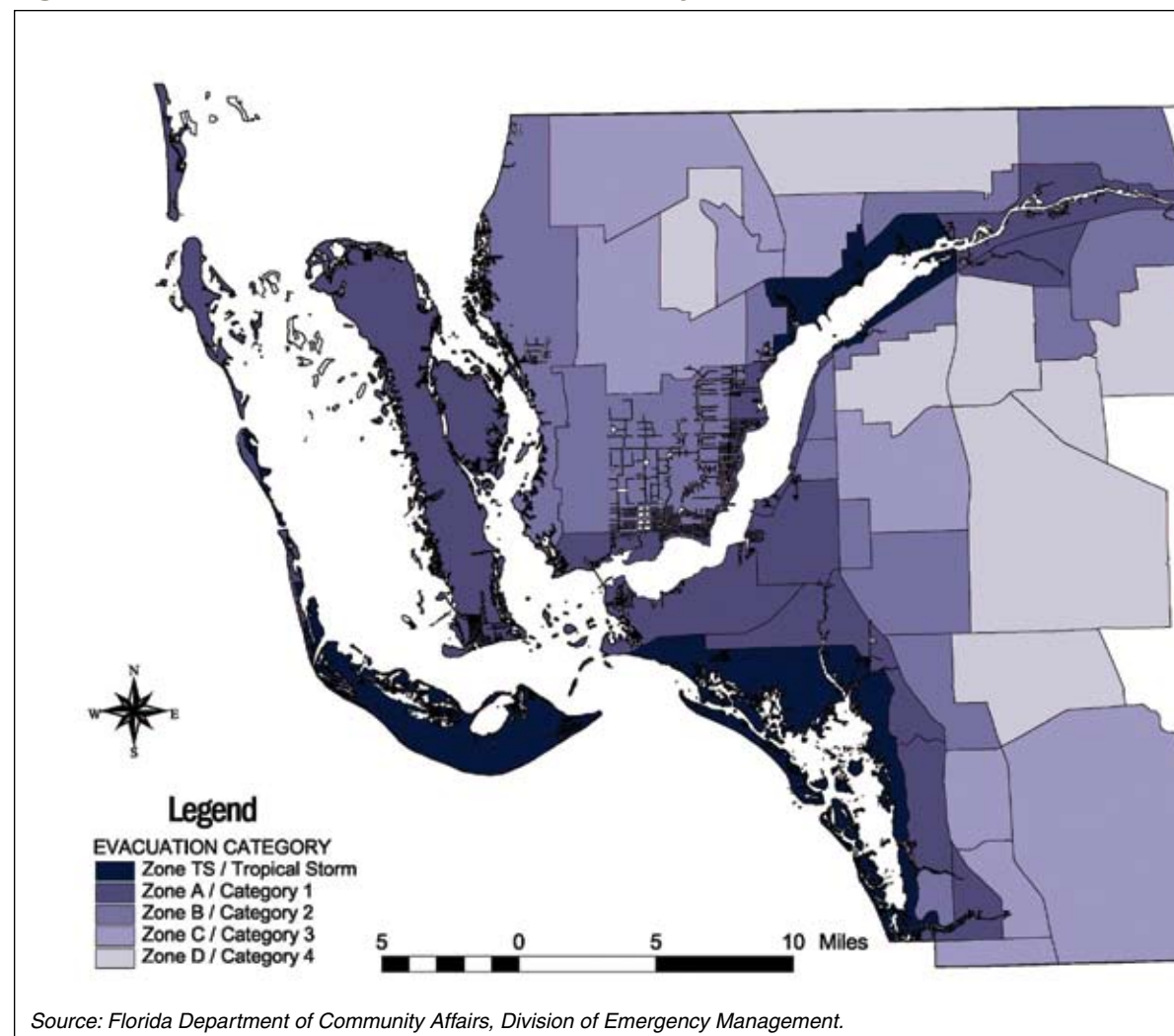
The regional hurricane evacuation study maps are based on the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model developed by the National Weather Service. Digital copies of these maps are available from the Florida Division of Emergency Management in vector format (see Figure 3.1). Also included in the regional hurricane evacuation studies are maps depicting the hurricane evacuation zones of each county. The boundaries of the evacuation zones are based on the surge zones, but modified to facilitate ready identification of zone boundaries. In some counties, separate evacuation zones are defined for each of the five hurricane categories (see Figure 3.2). In others, one or more of the surge zones may be aggregated (see Figure 3.3). Digital copies of these maps are generally available from the regional planning councils that prepared (or funded the preparation of) the regional hurricane evacuation studies.

Figure 3.1: SLOSH storm surge zones for Lee County, Florida.



Source: Florida Department of Community Affairs, Division of Emergency Management.

Figure 3.2: Hurricane evacuation zones for Lee County, Florida.



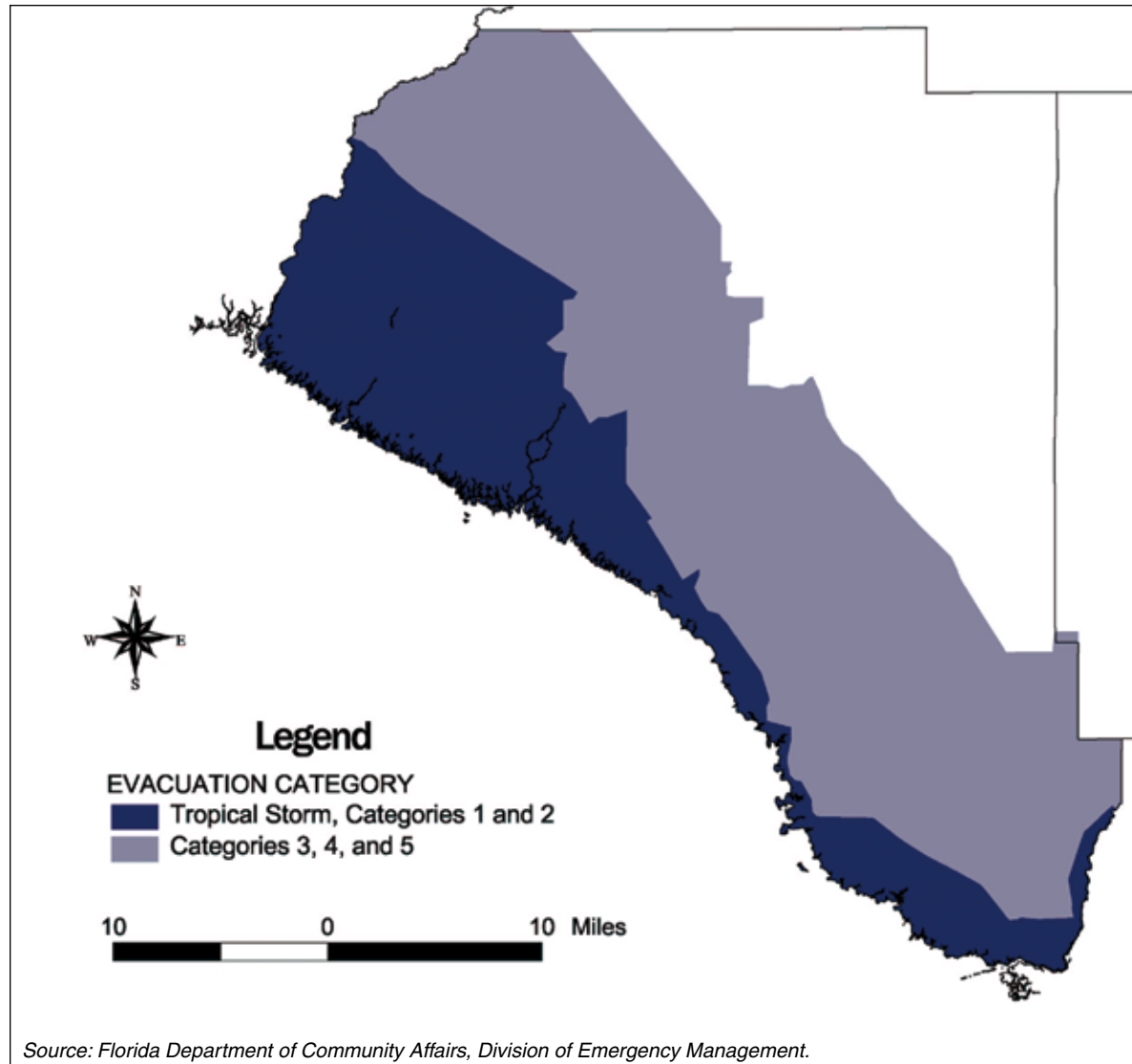
Kinetic Analysis Corporation and the University of Central Florida under contract with the Florida Department of Community Affairs, Division of Emergency Management (DEM) provided TAOS surge maps to Florida counties in 1999 and 2004 as part of hazards assessment data that was developed. These are produced from The Arbiter of Storms (TAOS) storm surge model. Digital copies of the maps are available in pdf and grid (raster) format through DEM's MEMPHIS system (see Sidebar 3.2).

#### Sidebar 3.3

### Repetitive Loss Structures

Repetitive loss structures are properties currently insured under the National Flood Insurance Program (NFIP) for which two or more NFIP losses (occurring more than ten days apart) of at least \$1,000 each have been paid within any 10-year period since 1978. As of March 2003, 533 structures in Florida were classified as repetitive loss structures. Information on repetitive loss structures in your community is available from the FDCA, Division of Emergency Management, Bureau of Recovery and Mitigation.

Figure 3.3: Hurricane evacuation zones for Taylor County, Florida.



### Wave impacts and inland flooding

Wave impact and inland flood hazard information is principally available in the form of Flood Insurance Rate Maps (FIRMs) prepared under the National Flood Insurance Program. These maps depict areas subject to flooding and the force of breaking waves of 3 feet or more in height (V zones) and areas subject to still-water flooding (A zones) associated with 100-year storm events. Digital copies of these maps in pdf and grid (raster) format are included in the TAOS hazard assessment information provided to Florida counties by DEM (see Figure 3.4).

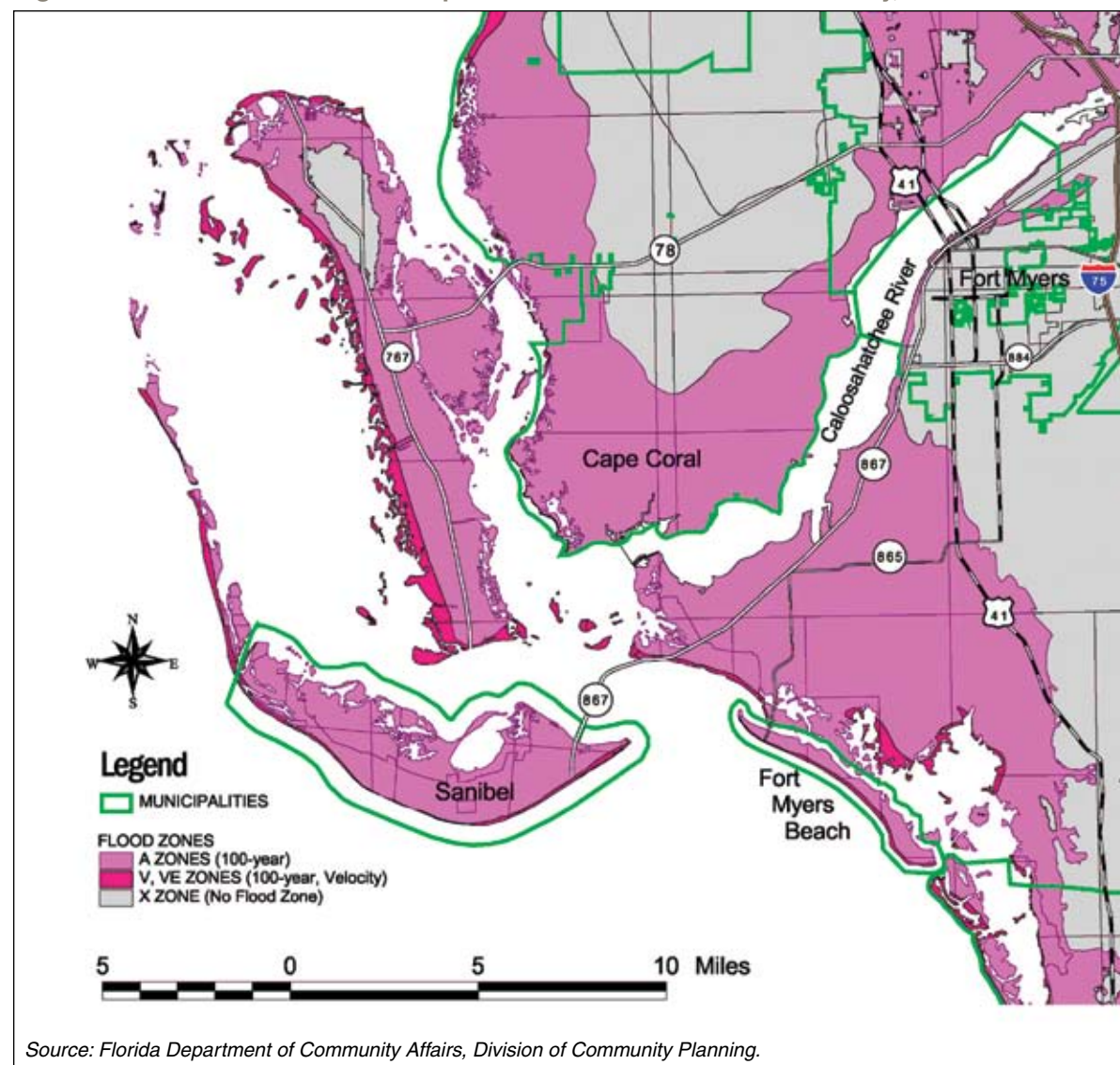
### Wind hazards

The TAOS hazard assessment information provided by DEM to Florida counties includes maps that depict wind field areas for peak 2-minute wind speeds at 10 meters above the ground associated with landfalling hurricanes of different magnitudes (see Figure 3.5). Digital copies of these maps are available in pdf and grid (raster) format from DEM's MEMPHIS system.

### Vulnerability assessment information

The purpose of vulnerability assessment is to determine who and what are in harm's way and the extent of injuries and damage that may result from hazard events of different magnitudes. The basic inventory data needed to conduct a vulnerability assessment include the following:

Figure 3.4: Flood Insurance Rate Map V zones and A zones for Lee County, Florida.



- the age and condition of private structures and public facilities and infrastructure in hazard-prone areas;
- the number and quality of historic structures in hazard-prone areas;
- the locations of repetitive loss structures (see Sidebar 3.3);
- the numbers of permanent and seasonal residents in hazard-prone areas; and
- the numbers of residents in hazard-prone areas who may be especially vulnerable because of age, income, or physical or mental condition.

Data on the age and condition of private structures are contained in each county's property appraiser's data base.

Data on public facilities and infrastructure that are pertinent to vulnerability assessment, may require some effort to accumulate. Each county emergency management office develops its own list of critical facilities that may include such facilities as the following:

- group quarters such as schools, churches, nursing/convalescent homes, correctional facilities, and mobile home parks;
- hazardous materials storage and disposal facilities including those for radioactive materials, fuel storage, and active and inactive landfills;
- health-related facilities such as hospitals, clinics, emergency medical services, Red Cross, animal-related facilities;

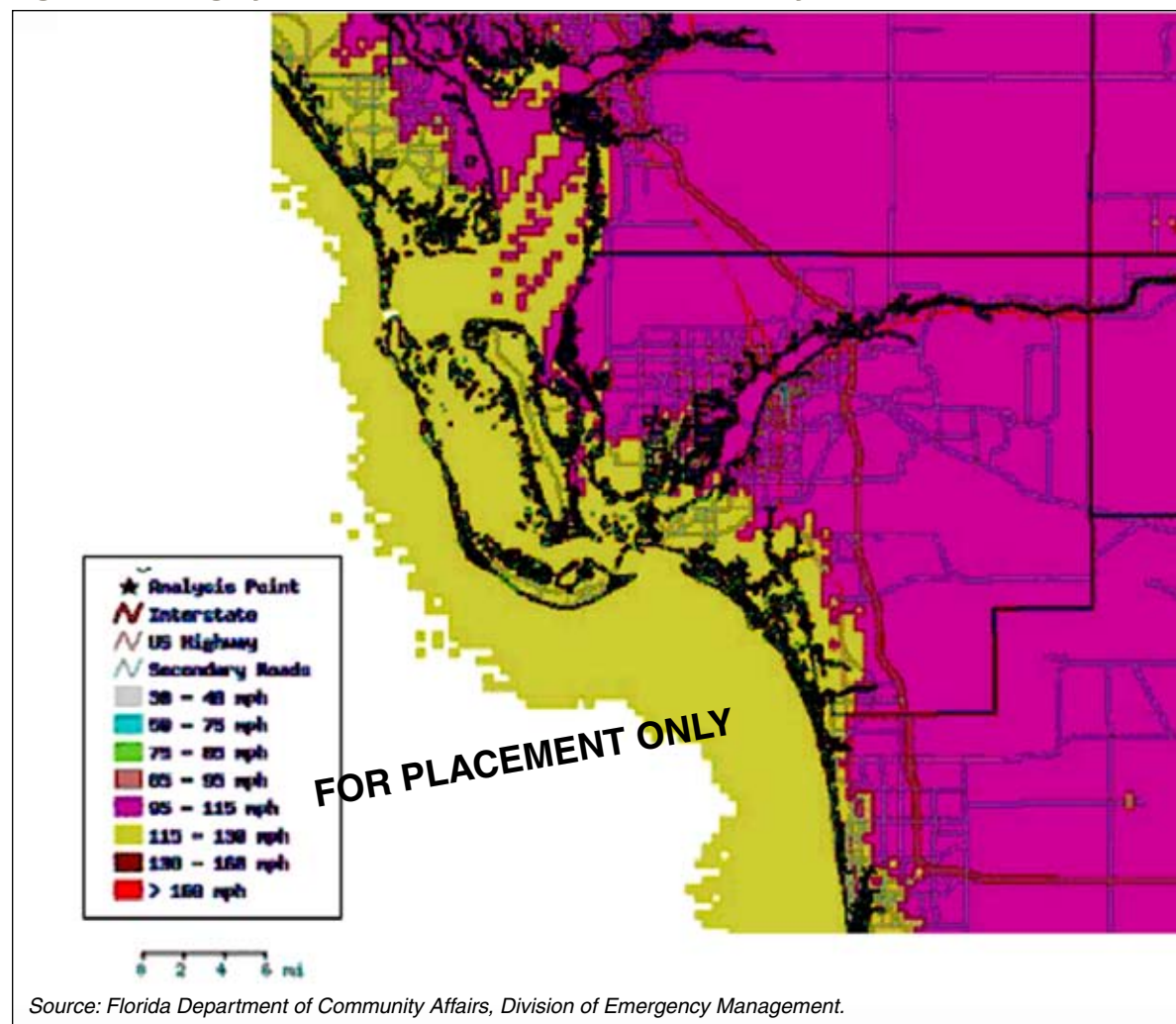
- public facilities and infrastructure such as fire departments, highway patrol, police and sheriff departments, communication facilities, electric utilities, sewage treatment, sewage lift stations, water treatment, water lift stations, and well heads;
- major transportation facilities including airports, marinas, sea ports, bridges, traffic control facilities, mass transit facilities, evacuation routes, maintenance facilities;
- military bases;
- emergency response facilities; and
- emergency shelters.

Data on historic resources are available from the Florida Department of State Master Site File and from local historic preservation organizations. Detailed guidance on how best to develop such an inventory is contained in FDCA's recently published guidebook entitled *Disaster Planning for Florida's Historic Resources* (see Sidebar 1.2 in Section 1.0 above).

Lists of repetitive loss structures in the state are available from DEM as well as spatial data in digital format (see Figure 3.6). Information on permanent and seasonal residents, including age, is available from the US Census Bureau at three levels: census tract, census block group, and census block.

The TAOS hazard assessment information includes vulnerability estimates for wind, flooding, tornadoes, thunderstorms and hail,

Figure 3.5: Category 3 hurricane wind hazard fields, Lee County, Florida.



Source: Florida Department of Community Affairs, Division of Emergency Management.

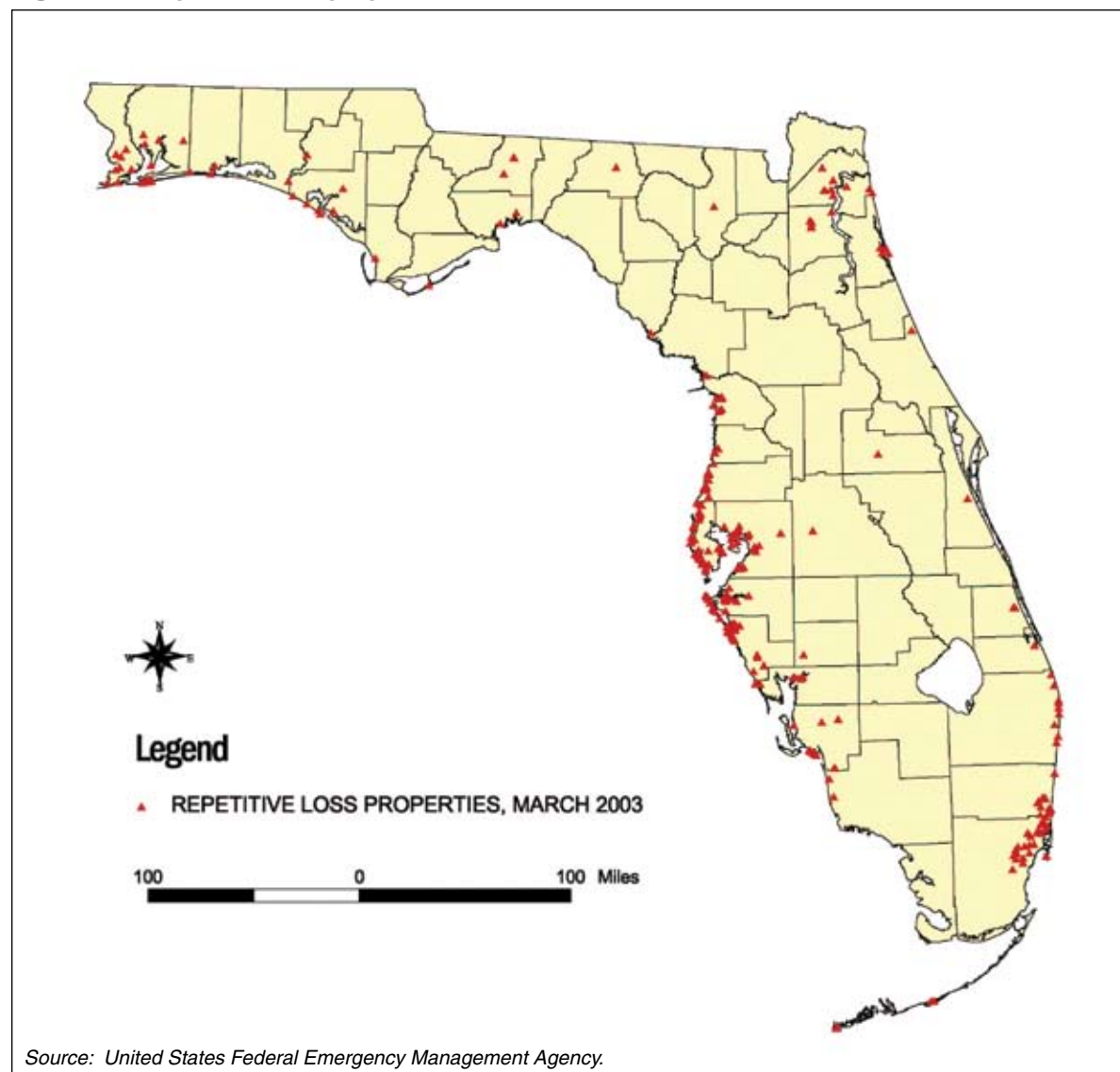
sinkholes, wildfire, earthquakes, and tsunamis. Estimates are provided for:

- numbers of structures likely to be damaged and the aggregate dollar damages for different private and public structure types based on Florida Department of Revenue land use codes;
- numbers of people whose residences are likely to be destroyed or severely damaged, in total and in separate vulnerability classes; and
- separate analyses for wind and flood damage based on 10, 25, 50, and 100 years storm events, including flood damage from both storm surge and rainfall.

Damages are tabulated in five categories: (1) destroyed (> 80% damage of estimated replacement value for the structure and contents); (2) severe (50-80%); (3) heavy (30-50%); (4) moderate (10-30%); and (5) light (< 10%). Separate vulnerability estimates are also provided for dollar damages that would result in the presence of mitigation that would increase wind resistance by 5 mph and reduce flood exposure levels by 1 foot.

The TAOS information can be used to assess a county, city, and census designated place (CDP)'s relative vulnerability to different natural hazards and to hurricanes of different magnitudes with and without wind and flood mitigation.

Figure 3.6: Repetitive loss properties in the state of Florida.



## Vulnerability assessment analysis

Vulnerability assessment has three principal applications to hazard mitigation and post-disaster redevelopment.

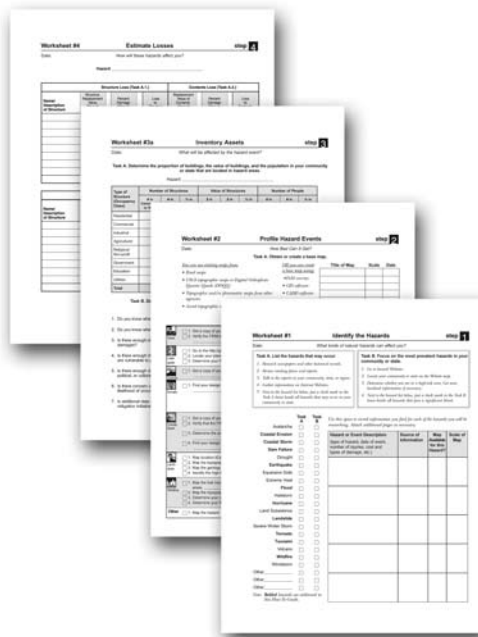
- It is critical to identifying public facilities and infrastructure that may require structural mitigation to reduce the potential for disaster damage. It is in this capacity that vulnerability assessment is most often used in developing *LMSs*.
- As noted above, vulnerability assessment of the current built environment can be very useful in preparing *PDRPs* when it is used to identify areas that may be possible candidates for redevelopment where disasters have sufficient impacts to trip redevelopment damage thresholds.
- The ideal application of vulnerability assessment in land use planning and growth management is for prospective evaluation of alternative future land use scenarios in the development of the future land use map and policies of the *future land use element* of the *Comprehensive Plan*.

Conducting a formal vulnerability assessment requires the ability to define where disaster forces will arise and to estimate the extent of damage that will occur to structures and facilities within those areas. Four vulnerability assessment resources are described in this section: (1) FEMA's *How-to Guide* for identifying hazards and estimating losses; (2) NOAA's CVAT; (3) the TAOS vulnerability assessment

model; and (4) the HAZUS-MH vulnerability assessment models.

## FEMA's How-to Guide

The second volume of FEMA's *How-to Guides* entitled *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 386-2) provides a series of worksheets that identify what information is needed and how to use it in the analysis of natural hazards including flooding, coastal storms, tornados, wildfires, and tsunamis. The process used in the how-to guides is consistent with the Disaster Mitigation Act of 2000 hazard mitigation plan



requirements for risk assessments. For more information see [http://www.fema.gov/fima/planning\\_toc3.shtm](http://www.fema.gov/fima/planning_toc3.shtm).

## NOAA's CVAT

CVAT (Community Vulnerability Assessment Tool) is a CD ROM product available from the National Oceanic and Atmospheric Administration (NOAA) that details a process for analyzing physical, social, economic, and environmental vulnerability to hazards at the local level. Also included on this CD-ROM is a comprehensive case study that demonstrates application of the vulnerability assessment methodology to New Hanover County, North Carolina. For more information see <http://www.csc.noaa.gov/products/nchaz/btm/methov.htm>.

## TAOS

TAOS is one of two principal software products available that analyze spatially explicit data using GIS and that incorporate damage functions to translate information about hazard forces and the characteristics of affected structures into damage predictions. The other is HAZUS-MH. TAOS is a proprietary software product developed by Kinetic Analysis Corporation (see Sidebar 3.1). The TAOS hazards assessment information provided to counties by DEM is based on data obtained by Kinetic Analysis Corporation. Local governments must contract with Kinetic Analysis Corporation to employ TAOS to conduct vulnerability assessments of current conditions using local data,

or prospective assessments to support future land use planning. For more information see <http://www.floridadisaster.org/brm/lms.htm> or contact the FDCA Division of Emergency Management.

### HAZUS-MH

HAZUS-MH is a public domain software product developed by the National Institute of Building Sciences (NIBS) for the Federal Emergency Management Agency (FEMA). The software can provide vulnerability assessment information for Florida communities using default data provided in the software, but for more accurate results, local data are required. Separate models are included for estimating earthquake, wind, and flood losses. For more information see <http://www.fema.gov/hazus/index.shtm>.

- The **HAZUS-MH Hurricane Wind Model** gives users in the Atlantic and Gulf Coast regions the ability to estimate potential damage and loss to residential, commercial, and industrial buildings. It also allows users to estimate direct economic loss, post-storm shelter needs, and building debris.
- The **HAZUS-MH Flood Model** is capable of assessing riverine and coastal flooding. It estimates potential damage to all classes of buildings, essential facilities, transportation and utility lifelines, vehicles, and agricultural crops. The model addresses building debris generation and

#### Sidebar 3.4

### Abbreviated Transportation Models – Evacuation Clearance Times

Abbreviated Transportation Models (ATMs) have been developed for each of the counties in the state except those covered by the southwest Florida regional hurricane evacuation study (HES). In the latter case, a spreadsheet model developed by the Southwest Florida Regional Planning Council can be used for the same purpose.

The primary intent of the ATMs is to provide land use planners, emergency managers, and other involved personnel with the capability to assess the impacts of development on clearance times and shelter demand in areas exposed to hurricanes. An ATM is a spreadsheet that simplifies the many calcu-

lations performed in the full HES transportation analysis and prepares an accurate, but easy to understand result. The program requires that the user know the traffic evacuation zones in which the development is located used in the HES, as well as the number and type (permanent residential, mobile home, or tourist) of residential units to be constructed. The ATM generates predicted evacuation clearance times for designated points along evacuation routes and estimates of the numbers of people from each traffic evacuation zone likely to use public emergency shelters.

shelter requirements. Direct losses are estimated based on physical damage to structures, contents, and building interiors.

### Risk analysis

The purpose of risk analysis is to quantify the aggregate probable injuries or damages a community may sustain from a given type of natural hazard for all possible hazard events that might affect a community. The end result

is typically an annualized estimate of damage, often in dollars, that would be expected on average for any given year.

Risk analysis can be a technically demanding process. It also requires data on the probabilities for each possible hazard scenario. For example, to perform a risk analysis of hurricane flooding, one needs information on all possible hurricane tracks and associated probabilities of hurricanes of different magnitudes striking the community along each track. Hurricane storm

track paths and probabilities are available from the National Hurricane Center's HURDAT database. For an example of a risk analysis application, see the Florida Planning and Development Lab's study of Lee County, Florida (see Sidebar 2.6).

The TAOS hazards assessment information provided to Florida counties by DEM in 2004 includes estimates of aggregate annualized dollar losses from wind, flooding, sinkholes, earthquakes, and wildfire with and without wind and flood mitigation. Separate estimates are provided for each land use code included in the State Department of Revenue's property appraiser database. These data can be used to assess a county's level of risk from different hazards and to assess the relative merits of wind (5 mph) and flood (1 foot) mitigation countywide.

### **Hurricane evacuation and shelter demand analysis**

As noted above, it is recommended that communities assess the impact of alternative future land use scenarios on evacuation clearance times and shelter demand. The 2003 Shelter Retrofit Report available online at [http://www.floridadisaster.org/internet\\_library.htm](http://www.floridadisaster.org/internet_library.htm) includes information on shelter capacities. Real time information on shelter locations, evacuation routes and shelter capacity is available online at [http://www.floridadisaster.org/citizen\\_emergency\\_info.htm](http://www.floridadisaster.org/citizen_emergency_info.htm).

Maps of hurricane evacuation routes are also available online at [http://www.floridadisaster.org/bpr/Response/Plans/Nathaz/Brochure/regional\\_evac.htm](http://www.floridadisaster.org/bpr/Response/Plans/Nathaz/Brochure/regional_evac.htm).

Hurricane evacuation clearance times and shelter demand estimates have been developed periodically as part of regional hurricane evacuation studies prepared by or for the regional planning councils in Florida. Local governments that have wanted to assess the effects of specific future land use scenarios have generally had to contract separately for such studies. The DEM has recently contracted with the consulting firm PBS&J to produce abbreviated transportation models (ATMs) for most regions of the state that can be used by local planners and emergency managers to easily assess the effects of possible changes in at-risk populations that would be subject to evacuation (see Sidebar 3.4).

### **Integrate, collaborate, coordinate**

This section advocates integrating hazard assessment information from the *CEMP* and *LMS* into the *Comprehensive Plan*, coordinating the procurement and analysis of hazard assessment data, and collaborating among local agencies that have the capability and the need to perform and utilize hazard assessment. Realization of the full potential of the *Comprehensive Plan* for reducing community vulnerability to natural hazards requires further integration, coordination, and collaboration, however, to assure that hazard mitigation policies are most

effectively applied to land use planning and capital facilities decision making. This is the focus of Section 4.0 of this guidebook.

# 4 Better Integrate Hazard Mitigation Policies Into the Comprehensive Plan and Its Implementation

The *Comprehensive Plan* is a powerful tool for creating a sustainable and disaster-resistant community. It provides the policy base for all local land development regulations and major capital expenditures, redevelopment programs, and other initiatives undertaken to further a community's goals and objectives for growth and development. The *Comprehensive Plan* is also the legal basis for all subsequent land use and growth decisions. For a community's hazard mitigation policies to be effective, they must be integrated into the comprehensive plan and its implementation.

The *future land use map (FLUM)* serves as the guide for future land use patterns in the community, and the policies of the *future land use element (FLUE)* provide the framework for determining appropriate land use intensities and densities and for initiating redevelopment programs that will help fulfill the community's vision of what it wants to become. Policies in the *capital improvements element* concerning the timing and location of public facilities and infrastructure also influence how, where, and when land is used for different purposes.

Florida communities have several opportunities for more effectively integrating hazard mitigation into their *Comprehensive Plans* and into the day-to-day land use and capital facilities decisions that are or should be guided by those plans. This section of the guidebook discusses the following best practices, targeted at increasing this integration:

- ✓ **Integrate – hazard mitigation policies.**  
There are opportunities to more effectively reduce community vulnerability by integrating relevant policies from a community's *LMS* and its *PDRP* into the *Comprehensive Plan* and vice versa.
- ✓ **Collaborate – planning and implementation.** Hazard mitigation can be more effectively integrated into the *Comprehensive Planning* process and into the implementation of *Comprehensive Plan* policies if people with appropriate knowledge and authority are involved in both the planning and decision making processes that generate and implement hazard mitigation policies.
- ✓ **Coordinate – plan reviews and updates.** While all four local plans have important roles to play in minimizing community vulnerability to natural hazards, assuring that their content is consistent requires an explicit strategy for coordinating reviews and updates of the individual plans.

## Section 4.1: Integrate Policies

Hazard mitigation policies may be found in three different local plans: *LMSs*, *PDRPs*, and *Comprehensive Plans*. While a well-done *LMS* may provide a good cross-walk of these policies, effective implementation requires that they be integrated into appropriate sections of the *Comprehensive Plan* that guide day-to-day decision making and that have legal standing as the reference for all land development regulations and decisions and for annual capital expenditures that affect policies contained in the plan. This argument is reinforced by recently promulgated federal regulations under the federal Disaster Mitigation Act of 2000 (DMA 2000) that require local governments to define the process through which they will incorporate the requirements of their mitigation plans into other planning mechanisms such as their *Comprehensive Plans* and *capital improvement elements (CIE)* (44 *CFR* §201.6(c)(4)(ii)).

Four initiatives are recommended for effectively integrating hazard mitigation and redevelopment policies into the *Comprehensive Plan* and for assuring that a community's hazard mitigation policies and programs are comprehensive and consistent across the *Comprehensive Plan*, *LMS*, and *PDRP*.

- **Provide a crosswalk and evaluation in the *LMS*** for the hazard mitigation policies in the *Comprehensive Plan* and *PDRP*.

One of the important tasks that should be conducted in preparing, or updating

an *LMS* is to identify and evaluate all of the community's policies and programs that have been developed to mitigate vulnerability to natural hazards, or that may influence, for better or worse, community vulnerability (Florida Department of Community Affairs, 1998). Such an exercise is essential to assuring that the community's policies and programs are both consistent and comprehensive.

Many communities have included policy "crosswalks" in the *Guiding Principles* sections of their *LMS*s. To be truly useful, these must be sufficiently detailed to allow identification of individual policies in their respective source documents, as well as offer an assessment of the impacts of each policy. Appendix B provides an excerpt from an exemplary mitigation policy crosswalk from the Manatee County *LMS* that lists individual policies, regulations, and objectives from the county *CEMP* and the *Comprehensive Plans*, land development codes and other ordinances, and building codes of Manatee County and its municipalities.

- **Incorporate all relevant hazard mitigation and post-disaster redevelopment policies** from the *LMS* into the *Comprehensive Plan* and *PDRP*.

As noted previously, hazard mitigation policies are more likely to be effectively implemented if they are incorporated in a community's *Comprehensive Plan*,

which has the force of law and is used on a day-to-day basis in local decision making. Therefore, if a community defines new hazard mitigation goals, objectives, or policies in its *LMS*, these should be added to the appropriate elements of the *Comprehensive Plan*, for example the *future land use, conservation, transportation, public facilities and services*, and *capital improvements elements*. Examples of relevant policies and the *Comprehensive Plan* elements in which they may be most appropriately incorporated, are presented in Section 6.0.

Where a community designs its *PDRP* as a guide to both the procedures and policy decisions that must be made during disaster recovery, it is similarly important that policies meant to guide those decisions are incorporated into the *PDRP* from the *LMS*.

Assuring that these policies are up-to-date and consistent across the three plans may be challenging. See the discussion in Section 4.3 below of strategies for coordinating plan reviews and updates.

- **Incorporate all relevant redevelopment policies** from the *Comprehensive Plan* into the *PDRP* and vice versa.

Again, for the *PDRP* to be a useful guide to the high-pressure decision making that occurs during disaster recovery, it is important that it include all relevant policies in the community's *Comprehen-*

*sive Plan*. Disasters may create opportunities for redevelopment that furthers both hazard mitigation goals and objectives and other community redevelopment objectives. Policies in the *Comprehensive Plan* governing both types of redevelopment initiatives ought to be included in a community's *PDRP*.

It is equally important, however, because of the unique legal stature of the *Comprehensive Plan*, that post-disaster redevelopment policies concerning land use and public facilities be incorporated by policy in the community's *Comprehensive Plan* rather than simply being listed in its *PDRP*.

- **Incorporate appropriate hazard mitigation projects** from the *LMS* into the *capital improvements element* of the *Comprehensive Plan*.

As discussed in Section 2.0, the *CIE* of a community's *Comprehensive Plan* assesses the costs, general fiscal implications, and priorities for remedying existing deficiencies and meeting future needs for public facilities identified in other elements of the plan. It also includes a five-year schedule of capital improvement projects that serves as the foundation for the community's annual capital budget.

A narrow interpretation of the relevant state regulations (§9J-5.016 *F.A.C.*) may suggest that it is not necessary to include the capital projects from a community's

*LMS* in its *CIE*. However, a community that wishes to be deliberate about its hazard mitigation initiatives and that follows the rationale presented in this section for formally addressing hazard mitigation in its *Comprehensive Plan*, should give serious consideration to doing so. In fact, the *CIE* requires that criteria be used to evaluate capital improvements projects, including prioritization of projects that eliminate public hazards (§9J-5.016 (3)(c)1. *F.A.C.*).

Some communities have chosen to do so. Indian River County, for example, reviews its *LMS* projects list each year as part of its annual review of the five-year schedule of projects in its *CIE*.

## Section 4.2: Collaborate – Planning and Implementation

Florida's communities are fortunate to have as many as four plans that can contribute to reducing potential losses from disasters. At the same time, this creates the need for careful coordination and collaboration to facilitate sharing and updating of key hazards information, maximize consistency and integration of plan content, minimize inefficiencies, and avoid working at cross purposes.

As described in Section 2.5, each plan has a designated planning body that is responsible for its periodic review and update. Each has its own planning process and time schedule as

well. Coordinating the timing of these separate planning processes is addressed in the next section. Here the focus is on assuring that key community organizations are involved in the development and implementation of each of the plans. If the planning process can be structured to include meaningful input from people who are responsible for producing relevant portions of each of the plans, then the content of the plans will be better integrated.

Collaboration with neighboring jurisdictions may also be important where the success of hazard mitigation and redevelopment initiatives depends in part on the actions of other cities and counties.

### Facilitate collaboration among local officials within the county

Effectively integrating the relevant content of the county *CEMP* and the community's *LMS*, *Comprehensive Plan*, and *PDRP* requires the involvement and collaboration of local government officials who understand the policies and their context in local government decision making. Identifying and engaging all the important parties will help inform the process at all stages and make sure that policies and program initiatives are as “do-able” as possible.

Effectively implementing the policies and programs in these plans require that knowledgeable local government officials who have the authority to execute the policies and

programs are involved in decisions where these policies and programs are considered.

With the exception of county *LMS* development, there is little formal guidance directed to local governments that explicitly encourages collaboration with local government organizations or targeting of specific interest groups during the preparation, review, and update of the four local plans that concern natural hazards (see also Section 2.5). The following sections summarize what direction is given and describe the principal participants in each of the four planning processes.

- ***CEMP***. There are no specific state planning process requirements for *CEMPs*, but counties share document the approach used to establish the local planning process and promote local participation (§I.C., *CEMP*-001). Some counties involve only a core group of county public agency staff that form the nucleus of the Emergency Operations Center staff in the event of a disaster. Others involve a much broader array of public agencies, including those that are involved in the decisions that guide the growth and development of their communities.
- ***PDRP***. There are no state directives concerning the process for developing a *PDRP*, and, as a result, there is relatively little documentation for how the plans have been prepared. Ideally the plan should be developed by local officials from

both the emergency management and planning realms so that the full spectrum of applicable operational procedures and policies as well as redevelopment policies governing land use and capital facilities are adequately captured in the plan.

Some communities establish Disaster Recovery Task Forces by local ordinance. These task forces are charged both with preparing and updating the **PDRP** and with implementing it during disaster recovery periods. Sidebar 4.1 describes Escambia County's Recovery Task Force. It includes a number of local officials who have roles unique to the demands of the disaster recovery process for whom there are no comparable roles in hazard mitigation or comprehensive planning:

- **county administrator,**
  - **county attorney,**
  - **medical director, and**
  - **budget and finance chief.**
- **LMS.** While there are state and federal guidelines and rules that require local governments to **solicit** participation by different local agencies and other government organizations and potentially interested groups in preparing the **LMS** (see Sidebar 4.2), Florida communities have had mixed success in actually involving all the organizations and individuals who ideally should participate.

#### Sidebar 4.1

### Escambia County Recovery Task Force

Escambia County's Recovery Task Force is appointed by the Board of County Commissioners. The Task Force is responsible both for preparing and implementing the county's **Post-Disaster Redevelopment Plan**. The Task Force's role is to "provide opportunities for cooperation between local governments during pre-disaster planning and post-disaster mitigation analysis and redevelopment."

#### Composition of the Task Force

The Recovery Task Force is composed of individuals (or their designees) who reflect a broad-base of community interests. According to the **PDRP**, the Task Force shall consist of, but is not limited to, the following individuals.

|                                                 |                                                                                                                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. County Administrator                         | Ex officios:                                                                                                                                                       |
| 2. County Special Projects Director             | 1. Representatives of the business community (appointed by the Chamber of Commerce)                                                                                |
| 3. County Attorney                              | 2. City of Pensacola Liaison                                                                                                                                       |
| 4. County Emergency Preparedness Director       | 3. City of Gulf Breeze Liaison                                                                                                                                     |
| 5. County Solid Waste Director                  | 4. Santa Rosa County Liaison                                                                                                                                       |
| 6. County Neighborhood Services Director        | 5. County Sheriff Liaison                                                                                                                                          |
| 7. County Public Works Director                 | 6. County School District Liaison                                                                                                                                  |
| 8. County Medical Director                      | 7. Northwest Florida Regional Planning Commission Liaison                                                                                                          |
| 9. County Utilities Authority Director          | 8. Santa Rosa Island Authority Liaison                                                                                                                             |
| 10. County Neighborhood Improvement Chief       | 9. Other representatives appointed by the Board of County Commissioners or the Recovery Task Force (i.e., Home Builders Association, League of Women Voters, etc.) |
| 11. County Budget and Finance Chief             |                                                                                                                                                                    |
| 12. County Building Safety Chief                |                                                                                                                                                                    |
| 13. County Growth Management Director           |                                                                                                                                                                    |
| 14. County Planning and Zoning Chief            |                                                                                                                                                                    |
| 15. Santa Rosa Island Authority General Manager |                                                                                                                                                                    |

Source: Schwab et al., 1998.

Some **LMS** documents have been prepared with active participation by both county planners and emergency management officials. Others have been prepared with little or no participation by one or the other local agency. As a general rule, **LMS** working groups include representatives from each of the municipalities within the county. Typically, however, that representation has consisted of a single individual associated with emergency management, public safety, or planning.

- **Comprehensive Plan.** State law requires the governing body of each local government to designate a “local planning agency” that is assigned the authority and responsibility for preparing the community’s **Comprehensive Plan** (§163.3174 *F.S.*). The statute is silent about the composition of the local planning agency other than requiring that a representative of the local school district be included, at least as a non-voting member. If a military installation is located within the community, then a representative of this installation must be included on the CPIA as a non-voting, ex-officio member. Guidance provided by the FDCA suggests specific interest groups that should be involved (see Section 2.5).

Table 4.1 illustrates of some of the collaborative roles of local agency actors that may be important to successfully integrating hazard

#### Sidebar 4.2

### *LMS* Working Group Participant Directives

**Florida’s LMS guidelines** recommend creation of a formal **LMS working group** that is commissioned by the local Board of Commissioners (Florida Department of Community Affairs, 1998).

**State regulations** governing eligibility for state-administered federal Hazard Mitigation Grant Program funds require counties to establish such working groups (§9G-22.004 **F.A.C.**) and to annually solicit participation from various agencies of county government, which may include, but need not be limited to, planning and zoning, roads, public works, and emergency management; municipalities within the county; interested private, civic, and non-profit organizations; trade and commercial organizations, property owners associations, water management districts, regional planning councils, independent special districts, and Native American tribes.

**FEMA’s Interim Final Rule** under DMA 2000 (44 **CFR** §291.6) requires that opportunities to be involved in the hazard mitigation planning process be provided to local and regional agencies involved in hazard mitigation activities, agencies that regulate development, neighboring communities, and interested businesses, academic institutions, and private and non-profit organizations.

mitigation and redevelopment planning and implementation. The most critical collaboration needed is the involvement of hazards data and analysis experts, emergency management officials, and planners in nearly all roles.

### Facilitate collaboration with neighboring jurisdictions

Some local land development and public facilities policies and initiatives may have spillover effects that extend beyond the boundaries of the jurisdiction that implements them. Policies and projects that affect natural hazard vulnerability, both positively and negatively, may have such spillovers. It is important, therefore, to also establish planning and implementation procedures that will ensure appropriate collaboration with other jurisdictions that may be affected by, or that may affect, a community’s land development and public facilities policies. However, this can be even more politically and logistically difficult than facilitating collaboration within a county.

The coordination and conflict resolution mechanisms included in the **intergovernmental coordination element (ICE)** of a community’s **Comprehensive Plan** (see Sidebar 4.3) should address such spillovers. It is important to identify the appropriate local agencies and organizations in other jurisdictions with whom to collaborate, but these will generally be the counterparts of those in the planning jurisdiction.

**Table 4.1: Possible collaborative roles of local agency officials in hazard mitigation and redevelopment planning and implementation.**

| Hazard Mitigation & Redevelopment Planning and Implementation Roles                                        | Local Officials                |                               |                                 |                                |                            |                     |                               |                        |                           |                        |                     |                      |                          |
|------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------|---------------------------------|--------------------------------|----------------------------|---------------------|-------------------------------|------------------------|---------------------------|------------------------|---------------------|----------------------|--------------------------|
|                                                                                                            | Hazards data & analysis expert | EM recovery operations expert | EM mitigation operations expert | EM evacuation & shelter expert | Planning & zoning official | Growth mgmt planner | Community development planner | Building code official | Natural resource managers | Public works officials | County/city manager | County/city attorney | Budget and finance chief |
| Prepare, review, & update LMS hazards identification & vulnerability assessment                            | ✓                              |                               |                                 | ✓                              |                            |                     |                               |                        | ✓                         |                        |                     |                      |                          |
| Prepare, review, & update CEMP hazards analysis                                                            | ✓                              |                               |                                 | ✓                              |                            |                     |                               |                        | ✓                         |                        |                     |                      |                          |
| Assess natural hazard constraints in FLUE land suitability analysis                                        | ✓                              |                               |                                 |                                | ✓                          | ✓                   |                               |                        | ✓                         | ✓                      |                     |                      |                          |
| Analyze proposed dev't & redev't in hazard areas for FLUE review & update and any proposed FLUM amendments | ✓                              |                               |                                 | ✓                              | ✓                          | ✓                   | ✓                             |                        | ✓                         |                        |                     |                      |                          |
| Re-evaluate community exposure & vulnerability after disasters                                             | ✓                              |                               |                                 | ✓                              | ✓                          |                     |                               | ✓                      |                           | ✓                      |                     |                      |                          |
| Review & update hazard mitigation policies in LMS, PDRP, & Comprehensive Plan                              | ✓                              |                               | ✓                               | ✓                              | ✓                          | ✓                   | ✓                             | ✓                      | ✓                         |                        |                     |                      |                          |
| Review & update hazard mitigation structural projects in LMS & CIE                                         | ✓                              |                               | ✓                               | ✓                              | ✓                          |                     |                               |                        | ✓                         | ✓                      |                     |                      |                          |
| Review & update hazard redevelopment policies in LMS, PDRP, & Comprehensive Plan                           | ✓                              | ✓                             | ✓                               | ✓                              | ✓                          | ✓                   | ✓                             | ✓                      | ✓                         | ✓                      |                     |                      |                          |
| Review & update PDRP operations policies and procedures                                                    |                                | ✓                             |                                 |                                | ✓                          |                     | ✓                             | ✓                      |                           | ✓                      | ✓                   | ✓                    | ✓                        |
| Participate as member of Recovery Task Force                                                               | ✓                              | ✓                             | ✓                               | ✓                              | ✓                          | ✓                   | ✓                             | ✓                      |                           | ✓                      | ✓                   | ✓                    | ✓                        |

#### Sidebar 4.3

### The Intergovernmental Coordination Element of the Comprehensive Plan

All local governments are required under the state's comprehensive plan regulations (§9J-5.015 **F.A.C.**) to include an **intergovernmental coordination element (ICE)** in their **Comprehensive Plans** in which they identify other units of government with which they interact and describe and assess existing coordinating mechanisms. The **CIE** includes objectives and policies for coordinating the community's comprehensive plan with the plans of other units of government and for addressing the impacts of proposed development on development in neighboring jurisdictions.

Examples of local government actions for which intergovernmental collaboration is likely to be important include the following:

- development and redevelopment policies and development proposal approvals that affect areas served by common evacuation routes;
- development and redevelopment proposal approvals and structural storm water and flood mitigation projects that may affect flood conditions in neighboring jurisdictions; and
- beach and dune renourishment and shoreline protection projects (e.g., seawalls, revetments, groins, or jetties) that may affect coastal sediment erosion or accretion rates in neighboring jurisdictions.

Identifying which organizations should collaborate is the first step. Effectively structuring the collaborative process and successfully engaging the desired participants in planning and implementation are separate challenges.

### Strategies for structuring collaboration

Desired collaboration can be facilitated by designating representatives from appropriate agencies, see Table 4.1, as members of the different planning bodies. Overlapping memberships of key agency staff facilitate sharing of knowledge and expertise and can build relationships that are important to success-

ful implementation of hazard mitigation and redevelopment policies and programs.

Another approach is to designate review committees that have the same or overlapping memberships that are advisory to the official planning bodies. As detailed in Sidebar 4.4, Okaloosa County has structured organizational collaboration of the planning processes for their *Comprehensive Plan* and *LMS* by designating a single committee that plays a major intergovernmental coordination role in both processes. While the membership is not as broad as suggested in Table 4.1, designating a single

committee assures consistency and continuity across the two planning processes.

### Strategies for engaging collaboration participants

Common constraints to effective collaboration during planning and implementation are summarized in Sidebar 4.5. The principal strategies for facilitating inter-organizational collaboration include (1) mandating collaboration and (2) educating organization actors to appreciate the benefits of voluntary collaboration. Each of these strategies is discussed further in the following sections.

#### Sidebar 4.4

### Creating Integrated Planning Teams: Okaloosa County's Comprehensive Plan Committee

When Okaloosa County began initial work on its *LMS*, the Board of County Commissioners designated the existing Comprehensive Plan Committee as the steering committee responsible for developing the *LMS*. The Comprehensive Plan Committee was initially established pursuant to the county's *Comprehensive Plan* to coordinate comprehensive plans for the local governments

in the county, plans of the school board and the Air Force, and to provide information regarding proposed development. It also functions as the initial mediator of conflicts that may arise between plans. The committee consists of staff from the county, the nine municipalities, Eglin Air Force Base, Hurlburt Field, and the Okaloosa County School Board.

#### Sidebar 4.5

### Institutional factors that may play a role in constraining the integration of local hazard mitigation plans

**Lack of awareness.** Staff in one agency may simply be unaware of the activities of other agencies and individuals in the same community and the relevance of those activities to their hazard mitigation initiatives.

**Cost avoidance.** People or agencies may be aware of the potential for collaboration but be unwilling to assume additional work or responsibility.

**Lack of resources.** People and agencies may be aware of the benefits of collaboration but cannot see how to do it because of real or perceived issues of not enough staff, funds, or resources.

**Turf.** Some people or agencies may be unwilling to share their resources, power and influence with other agencies.

- **Mandate collaboration and hold participants accountable.**

As noted above, state and federal directives concerning who should participate in the *CEMP*, *CMS* and *PDRP* programs is limited to requirements for documenting the procedures used to invite or encourage potentially interested organizations to participate. Thus, the direction for collaboration must come from within the local government itself, either from the county/city manager or the board of commissioners (BOC).

One approach, therefore, is for the county/city manager or BOC to formally create the planning body or advisory committee by ordinance and to stipulate which local agencies are to be members.

Formalizing the organizational structure for the planning process is a critical step to facilitating collaboration. It also may be necessary, however, to hold the designated participants accountable for fulfilling their assigned participation responsibilities. This would require oversight by the county/city manager or BOC.

- **Educate locals to appreciate the benefits of voluntary collaboration.**

One obstacle to fostering collaboration among different organizations that play a role in hazard mitigation is a lack of awareness of the roles played by other individuals and organizations. A team building exercise structured around a

mitigation and planning premise can help members of different organizations to better appreciate the nature of the decisions they will face and the value of collaborating with other organizations that can bring expertise and resources to bear on those decisions. The STORM gaming simulation administered by the FDCA is an example (see Sidebar 4.6).

### Section 4.3: Coordinate – Plan Reviews and Updates

Conditions in communities change over time and experience brings new insight. As a result, community perceptions change about what is important, what they want their communities to be like, and how they should achieve their visions. For plans to be useful, it is important to keep them up-to-date through an institutionalized process of review and revision built on the following tasks:

- monitor progress on current policies and program initiatives;
- re-evaluate the social, economic, and physical conditions of the community using up-to-date data and analytic methods;
- re-assess operational procedures and policies (in *CEMPs* and *PDRPs*) based on experience; and
- re-assess the community's goals, objectives, and policies.

## Sidebar 4.6

## STORM – A Recovery and Mitigation Gaming Simulation Exercise

The STORM gaming simulation, developed by the Florida Planning and Development Lab at Florida State University, presents players who constitute the recovery task force team for a hypothetical coastal county with the major operational and policy decisions likely to be faced during recovery from a major (Category 3) hurricane: debris collection and disposal, infrastructure repair and reconstruction, permitting of private-sector repair and reconstruction, and securing of federal Hazard Mitigation Grant Fund monies for post-disaster mitigation initiatives.

The game is designed to demonstrate both the value of mitigation in reducing future community vulnerability and the value of hazard mitigation and post-disaster redevelopment policies in a community's **Comprehensive Plan** in guiding recovery decision making.

DEM's, Bureau of Recovery and Mitigation offers the eight-hour STORM simulation annually at Florida's Governor's Hurricane Conference. The bureau also will run the game on request for local governments and other groups involved in public disaster recovery and mitigation.

Three of the four local plans that concern natural hazards have formal review and updating processes that are stipulated by state and/or federal rules.

- **CEMP.** Counties are required to revise their **CEMPs** every four years, with the state divided into four groups of counties whose plans are scheduled for revision and state review and approval on a rotating basis (§9G-6.006, *F.A.C.*).
- **LMS.** To qualify for federal disaster mitigation funding under the Disaster Mitigation Act of 2000 (DMA 2000), local hazard mitigation plans must be revised at least every five years. State regulations, however, stipulate two shorter review cycles (see Sidebar 4.7).
- **Comprehensive Plan.** Florida law requires every community to complete an *Evaluation and Appraisal Report (EAR)* every seven years (see Sidebar 4.8). In addition, communities may adopt major amendments to their plans twice each year.

There are no stipulations governing revision of **PDRPs**, but it is strongly recommended that they be amended following disasters if disaster recovery and redevelopment experience suggests changes are needed. **PDRPs** also should be amended whenever policies governing post-disaster redevelopment are changed in the community's **Comprehensive Plan** or **LMS**. Effectively integrating the relevant content of these plans, as well as that of a **PDRP**, requires

## Sidebar 4.7

## LMS Review Schedules

Under the **LMS** should be revised at least every five years (44 *CFR* §201.6(c)(4)). FDCA contracts with municipalities for updating their **LMSs** to comply with the DMA 2000 regulations also stipulate a five-year review cycle.

The state's criteria for **CEMPs**, however, require that **LMSs** be revised coincident with the **CEMP** (every four years) where communities elect to meet the **Mitigation Annex** requirements of the **CEMP** by incorporating their **LMS** by reference (§III., *CEMP*-001). The state's regulations governing eligibility of local governments for federal Hazard Mitigation Grant Funds administered by the state, require annual updates of the **LMS** (§9G-22.004(4)(e) *F.A.C.*).

#### Sidebar 4.8

## Evaluation and Appraisal Report

The ***Evaluation and Appraisal Report (EAR)*** process, specified by state law (§163.3191, ***F.S.***), requires all communities in Florida to assess their progress in implementing their ***Comprehensive Plans*** once every seven years. Based on the evaluation, the ***EAR*** provides recommendations for revising the plan to better address community goals and objectives, changing conditions and trends, and changes in state requirements regarding local growth management. Proposed ***EAR***-based amendments to a community's ***Comprehensive Plan*** are submitted to FDCA for review and approval. Communities have up to eighteen months to formally adopt the ***EAR***-based amendments after approval by FDCA. FDCA provides workshops and technical assistance for preliminary work to undertake the ***EAR***, in addition to arranging for staff to meet with local governments.

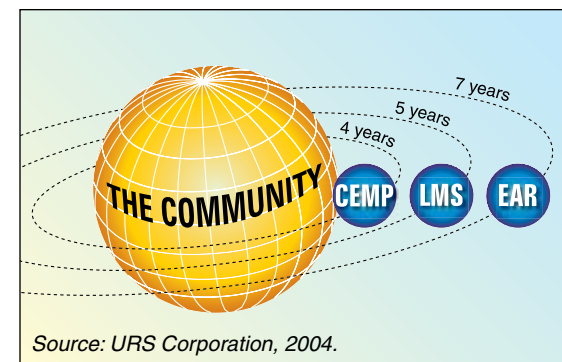
For more information, see <http://www.doc.state.fl.us/fdcp/DCP/ear/indexear.htm>.

coordination of the timing and procedures employed for reviewing and amending the plans.

The information can flow from one plan to another depending on which is the next to be updated. As shown in Figure 4.1, if a community follows the four-year ***CEMP*** cycle, the five-year ***LMS*** cycle, and the seven-year ***Comprehensive Plan*** cycle, the plan revisions will “align” only once in 140 years! The worst case is where a community's ***EAR*** cycle starts when the ***LMS*** is four years old. Even if the ***LMS*** revisions are done annually or every four years to coincide with the ***CEMP***, the time between alignments can still be as much as 28 years! It is essential, therefore, that a method for coordinated revision be developed that can be applied whenever one of the four plans is scheduled for review and revision.

The ***hazard identification and vulnerability assessment (HIVA)*** component of the ***LMS*** can be viewed as the linchpin for coordinating the revision of a community's four hazards plans. A community's hazard mitigation and post-disaster redevelopment policies should be re-evaluated whenever significant new information is available concerning a community's hazard exposure, vulnerability, and risks. Disaster experience may dictate a need to re-assess disaster recovery and redevelopment operational procedures and policies and hazard mitigation and post-disaster redevelopment policies. Changes in the forces that drive growth and development in a community also may dictate a need

**Figure 4.1: Florida plans and their revision cycles.**



to reassess hazard mitigation and redevelopment objectives and policies.

The following procedures are suggested for keeping local plans abreast of these changes and for coordinating them with each other in a timely fashion.

- Review the ***PDRP*** coincident with the ***EAR*** cycle to assure that relevant amendments to the ***Comprehensive Plan*** are incorporated in the ***PDRP***.
- Amend the ***PDRP*** if major amendments are made to post-disaster redevelopment policies in the ***Comprehensive Plan*** during one of the semi-annual major amendment cycles.
- Adopt amendments to the operational procedures or policies of the ***PDRP*** whenever disaster experience suggests the need for revisions and make parallel revisions to

the *Recovery Annex* of the *CEMP* during the next *CEMP* revision cycle.

- Adopt amendments to the post-disaster redevelopment policies in the *PDRP* and *Comprehensive Plan* as part of the *Comprehensive Plan* semi-annual major amendment cycle when disaster experience suggests the need for change.
- Review and revise the list of prioritized structural mitigation projects in the *LMS* coincident with the annual update of the capital projects schedule in the *capital improvements element* of the *Comprehensive Plan*.
- If the *HIVA* and the full *LMS* are revised annually pursuant to state regulations governing eligibility for state-administered federal HMGP funds, make appropriate revisions to the *CEMP*, *Comprehensive Plan*, and *PDRP* during the regular review and amendment cycles for those plans, and reflect those revisions in the *LMS*.
- If the full *LMS* is only revised every four years, coincident with the *CEMP* review cycle, or if it is revised every five years in compliance with the maximum revision cycle under DMA 2000, review an out-of-cycle review for portions of the *Comprehensive Plan* if the revised *HIVA* of the *LMS* reveals significant changes in community exposure or vulnerability.

- If community exposure to natural hazards forces is significantly different than previously assumed, revise the suitability analysis of existing vacant or undeveloped land in the *future land use element (FLUE)*. This may then indicate a need to amend the *future land use map (FLUM)*.
- If the community's vulnerability to natural hazards is different than previously assumed, change to the *FLUM* or to hazard mitigation and post-disaster redevelopment objectives and policies in the *FLUE* or other elements of the *Comprehensive Plan*.

Such amendments can be initiated as part of the semi-annual major amendment cycle.

### What are the best tools?

With the best hazards assessment data and analyses incorporated into the comprehensive planning process and strategies in place for integrating, collaborating, and coordinating hazard mitigation and post-disaster redevelopment policies and their implementation, the remaining task is to select an optimal array of land use planning strategies and development practices for implementing those policies. Section 5.0 describes the principal planning and development management tools that have been used and provides examples of their use for implementing each of the four strategies for reducing community vulnerability.

# 5 Use Best Land Use Planning and Development Management Practices for Reducing Community Vulnerability

An array of land use planning and development management tools are available to local governments for implementing hazard mitigation and post-disaster redevelopment policies in their *Comprehensive Plans*. For the most part, these are familiar tools of the planning and growth management profession. Specific applications to hazard mitigation and post-disaster redevelopment may be more novel, however.

Section 5.1 provides a brief overview of the tools that may be used, followed by descriptions in Sections 5.2 through 5.4 of specific applications for each of the four strategies for reducing community vulnerability to coastal storms and associated flooding:

- ✓ get out of the way: provide evacuation and sheltering services,
- ✓ make the environment less hazardous: maintain and enhance natural protective features,
- ✓ make structures more resistant to natural hazard forces, and
- ✓ manage the development and redevelopment of land exposed to natural hazards.

## Section 5.1: Land Use Planning and Development Management Tools

Florida communities are using many of the tools described in this section to finance the provision of public facilities and services, protect environmentally sensitive features, and

influence and control development and redevelopment on private lands. These tools can be used to implement one or more of the four strategies for reducing community vulnerability to natural hazards. Table 5.1 provides a summary of the strategies for which each tool is useful. Applicability to pre-disaster and post-disaster settings is also noted.

**Table 5.1: Land use planning and development management tools for hazard mitigation and post-disaster redevelopment.**

| Pre-Disaster | Post-Disaster | Planning and Management Tool                      | Provide Evacuation and Sheltering | Maintain and Enhance Natural Protective Features | Make Structures More Resistant to Natural Hazard Forces | Manage Development & Redevelopment in Hazardous Areas |
|--------------|---------------|---------------------------------------------------|-----------------------------------|--------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|
| ✓            | ✓             | Building codes                                    |                                   | ✓                                                | ✓                                                       | ✓                                                     |
| ✓            | ✓             | Zoning regulations                                |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            | ✓             | Overlay districts                                 |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            | ✓             | Setbacks and buffers                              |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Subdivision regulations                           |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Planned unit development regulations              |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Site design regulations and performance standards |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Cluster development                               |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Incentive zoning                                  |                                   | ✓                                                | ✓                                                       | ✓                                                     |
| ✓            | ✓             | Fee-simple property acquisition                   |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            | ✓             | Purchase-and-sellback or leaseback                |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            | ✓             | Purchase of development rights and easements      |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            |               | Transfer of development rights                    |                                   | ✓                                                |                                                         | ✓                                                     |
| ✓            | ✓             | Capital expenditure policies and programs         |                                   | ✓                                                | ✓                                                       | ✓                                                     |
| ✓            |               | Financing capital and operating costs             | ✓                                 | ✓                                                |                                                         |                                                       |
| ✓            | ✓             | Education and information                         | ✓                                 | ✓                                                | ✓                                                       | ✓                                                     |

## Building codes

Building codes define standards and requirements that govern the design and construction, maintenance and operation, occupancy, use, and appearance of buildings. Under the Florida Building Code Act, the Florida Building Code officially replaced all local codes on March 1, 2002. However, local governments are permitted to adopt more stringent provisions where local conditions warrant. Other regulations governing building construction include flood protection regulations pursuant to the National Florida Insurance Program and the state Coastal Construction Control Line permitting standards (CCCL).

Applications of particular interest to hazard mitigation are provisions governing a structure's resistance to wind-borne debris and standards for elevation and flood-proofing. See Section 5.4 for more details.

## Zoning regulations

Zoning ordinances divide a jurisdiction into districts based on the *future land use map* of the community's **Comprehensive Plan**, with different regulations governing the types of land uses allowed and the intensity of the uses based on density, floor-area ratio, or lot size. Zoning regulations also may address the types of buildings permitted, their height and bulk, and their placement on a property parcel.

Zoning is most effective for guiding new development of vacant land. Where an existing land use is inconsistent with the existing zon-

ing regulations, or where inconsistencies are the result of re-zoning, land uses become non-conforming uses. Typically, non-conforming uses cannot be expanded and must be converted to

conforming uses if substantial repairs, reconstruction, or remodeling are undertaken, or if the use is discontinued.

The exercise of zoning regulation is subject to constitutional constraints, which require that some economically viable use of the land be

### Sidebar 5.1

## Constitutional Limitations on Land Use Regulation

The United States Constitution forbids the taking of private property for a public use without just compensation or without due process of law. A taking may include physical appropriation of land or regulation of land to the extent that all economically viable uses of the property are eliminated.

Regulation, however, seldom removes all economically viable use of land. Thus, in the majority of cases, the test is whether the regulation goes "too far." While no hard and fast rules exist for this "test," the U.S. Supreme Court has identified various factors to consider in determining if a questioned regulation has gone "too far." These include: the character of the government action, the economic impact of the regulation, and the extent to which the action interferes with the reasonable investment-backed expectations of the property owner.

Character of the government regulation refers to how the government is regulating. Courts appear more likely to find a taking if the regulation eliminates a substantial

property right such as the right to use, possess or dispose of the property.

The economic impact of the regulation relates to how much it diminishes the value of the land. Courts determine this by looking to the land's value before and after imposition of the challenged regulation. As noted, in the unusual case that all economically viable use of the land is destroyed, a taking is much more likely.

The consideration of reasonable investment-backed expectations involves an inquiry into whether the owner retains uses that were reasonably expected to be available for the property and for which the owner paid when purchasing the land. This factor usually makes it difficult, if not impossible, for a landowner to challenge regulations that affected the value of uses of the property before the landowner took possession.

There are exceptions. All economically viable use of land may be prohibited if that use would constitute a nuisance or is prohibited by underlying principles of property law.

*Source: Adapted from University of Florida College of Law Conservation Clinic, "Implementation of the Model Land Development Code for Florida Springs Protection," 2004.*

preserved. Thus, zoning cannot be used to impose a blanket prohibition on all development without compensating the property owner (see Sidebar 5.1). Down-zonings or other substantial restrictions, which limit or reduce the allowed land use intensities, also may be subject to legal challenge under Florida's Bert Harris Act (see Sidebar 5.2).

Hazard mitigation and post-disaster redevelopment applications of zoning primarily involve regulating or prohibiting certain uses within hazard zones to do one or more of the following:

- maintain or enhance natural protective features;
- reduce the demand for evacuation shelter space and evacuation clearance times;
- minimize the number of persons who may lose their homes and businesses;
- minimize the exposure of property and infrastructure to damage; or
- minimize evacuation and recovery costs.

Specific applications are discussed in Sections 5.3 and 5.5.

## Overlay districts

Overlay districts are drawn on top of the land use districts of a community's future land use map and the corresponding zoning districts of its zoning map. Overlay districts are used to apply additional regulations to land uses beyond those that apply to the underlying districts. They may cover parts of several underly-

### Sidebar 5.2

## Bert J. Harris, Jr., Private Property Rights Protection Act

The 1995 Bert Harris Act (§ 70.001, Florida Statutes) reflects the judgment of the Florida Legislature that takings law under the U.S. and Florida constitutions did too little to protect private property and placed too much of the burden of regulation for the common good on private property owners. The act creates a separate and distinct cause of action from takings law.

The act requires compensation to landowners for regulations that "inordinately burden" property. The remedy may include compensation for the actual loss to the fair market value of the land resulting from the government regulation. It applies to any law, regulation, or rule noticed for adoption or adopted after May 11, 1995.

Published case law has not yet interpreted many of the key terms in the act. Thus, it remains difficult to predict what facts or economic impacts might lead to a government action losing in a claim under the act. While few claims have been adjudicated, many claims under the act have been filed and settled before trial. Thus, the act presents

possible costs in legal and settlement expenses for local governments even for those cases that never reach the courtroom.

Provisions that may give rise to such claims include open space requirements, prohibitions on development, and mandatory transfer of development rights programs that lack guaranteed development rights markets. Constitutional takings claims can usually be avoided in most of these areas by ensuring that landowners retain some development right on the property or the property as a whole retains some significant value. It is, however, much more difficult to predict whether claims under the Bert Harris Act will result in substantial costs to local governments.

The act specifically allows that settlement offers to aggrieved land owners may include, among others, such things as modifications to permits or development densities, land swaps, transfer of development rights, and variances or special exceptions.

*Source: Adapted from University of Florida College of*

*Law Conservation Clinic, "Implementation of the Model Land Development Code for Florida Springs Protection," 2004.*

ing land use and zoning districts or only a portion of one underlying district. In cases where there is a conflict between the requirements of the overlay district and those of an underlying land use or zoning district, the overlay requirements take precedence.

Principal applications include both pre- and post-disaster protection of natural protective features and restrictions on land use types and intensities within hazard areas. See Sections 5.3 and 5.5.

### Setbacks and buffers

Setback requirements govern the placement of a structure on a lot relative to some reference such as the lot line, street, or some physical feature. Traditional applications are for assuring adequate public rights-of-way for streets and sidewalks and adequate separation between buildings for health and safety reasons. Hazard mitigation applications include avoidance of hazardous areas and creation of buffers around natural protective features such as wetlands, floodplains and coastal barrier resources, such as beaches and sand dunes. These are typically applied to new development, but they also may be imposed on non-conforming structures that are substantially damaged after a disaster where there is sufficient room on the lot for the structure to be rebuilt in a different location. See Sections 5.3 and 5.5.

### Subdivision regulations

Subdivision regulations govern the division of land and the density, configuration, and layout of the resulting parcels. Subdivision regulations also define design and performance standards for required improvements such as streets, sidewalks, storm water drainage, sewage, lighting, etc. The associated plat review process provides opportunities to

- ensure conformance with applicable zoning and subdivision requirements, including site design regulations and performance standards;
- analyze impacts on community infrastructure and services such as schools, recreation facilities, roads, water supply, and sewage disposal; and
- negotiate remedies to undesirable impacts through such means as cluster development, dedications, and exactions.

Hazard mitigation applications include the use of dedications and exactions (see below) to mitigate impacts on evacuation clearance times and shelter demand, design and performance standards to manage storm water runoff, make infrastructure disaster resistant and plat configurations such as cluster development (see below) to avoid damage to natural protective features or development of hazardous areas (see Sections 5.3 and 5.5). These are predominantly pre-disaster applications except in the unusual event of re-subdivision (re-platting) of land after a disaster.

### Planned unit development regulations

Planned unit development (PUD) provisions allow flexible allocation of land uses within a large development through review of a multi-use development as a single entity. PUDs also permit regulatory oversight comparable to that afforded through subdivision regulation and the use of such measures as cluster development (see below) to avoid damage to natural protective features or development in hazardous areas. One approach is to designate PUDs on the zoning map. An alternative is to treat PUDs as a form of floating or overlay zone and allow them in certain districts under certain conditions. As with subdivision regulations, applications are principally in pre-disaster settings. See Sections 5.3 and 5.5.

### Site design regulations and performance standards

Site design regulations stipulate how subdivisions, PUDs, and individual lots are laid out and developed including design and placement of sidewalks, streets, and parking lots; lighting; landscaping; grading; utilities; sewers and septic systems; and stormwater management. Performance standards provide greater flexibility for some systems; for example, stipulating the maximum quantity of runoff that may leave a site but leaving it to the developer to choose the most cost-effective means of managing stormwater onsite.

Site design regulations and performance standards may be imposed based on land use

type through the zoning ordinance as well as within overlay districts. Application may occur as part of subdivision plat review as well as during site plan review for development of individual parcels. These are principally used in the realm of hazard mitigation to protect natural protective features (section 5.3) and to regulate landscaping and storm water management (section 5.5) in pre-disaster settings.

### **Cluster development**

Cluster development regulations, which are generally contained in both the zoning and subdivision ordinances, provide the option of concentrating development within a portion of a subdivision or PUD, thus leaving a portion of the land undeveloped. Cluster development may be used to provide amenities such as passive open space or active recreation areas, to protect sensitive environmental features, including natural features such as wetlands and dunes that provide protection against natural hazards, or to avoid hazardous areas. Typically the developer is permitted to retain the overall density allowed on the site and concentrate it on less sensitive portions of the site. Incentive zoning (see next section) may offer a developer additional density in return for clustering development. Hazard mitigation applications, which are described in Sections 5.3 and 5.5, principally apply to new development in pre-disaster settings.

### **Incentive zoning**

Incentive (i.e., performance) zoning is a tool that allows developers to exceed certain zoning restrictions, such as those governing density, floor-area ratios, or height, in return for providing amenities or making additional concessions. Such incentives may be offered for maintaining or enhancing the natural protective features of a site, for encouraging cluster development to avoid hazardous areas (see above), or for providing additional safety features such as safe rooms. Incentive zoning may be applicable to redevelopment projects as well as new development, but it is principally applied in pre-disaster settings. Specific applications are described in Sections 5.3, 5.4, and 5.5.

### **Fee-simple property acquisition**

Fee-simple acquisition involves purchase of the full title to land. It is typically used where public use of the land is intended for providing amenities such as open space or recreation or for constructing public facilities or infrastructure. However, it also may be used to preclude development or to eliminate existing development, often in concert with other tools such as zoning or leasing (see below).

Fee-simple acquisition affords the greatest degree of control over how land is used and avoids the potential for takings law suits or litigation under Florida's Bert Harris Act (see Sidebars 5.1 and 5.2). However, acquiring title in fee simple can be expensive. Fee-simple land acquisition has high capital costs, incurs

on-going costs for maintenance, and removes land from the tax rolls. Acquisition also may be politically unpopular, especially where governments choose to exercise the power of eminent domain to condemn land for public use where the owner is not willing to sell voluntarily.

Hazard mitigation and post-disaster redevelopment applications include purchase of vacant land to preclude development in hazardous areas or to maintain or enhance natural protective features, and purchase of developed land to remove threatened or damaged structures and to preclude future re-development. See Sections 5.3 and 5.5 for further discussion of applications.

### **Purchase-and-sellback or leaseback**

Two alternatives that partially mitigate the costs of fee-simple acquisition involve local government purchase of land and then reselling it on the market or leasing it for use by private individuals. These approaches can allow for complete control of how the land is used, without raising takings issues or legal claims under Florida's Bert Harris Act (see Sidebars 5.1 and 5.2). They also allow the government to recoup some of the costs of acquisition, greatly reduce maintenance costs, and mitigate the loss of property tax revenues.

Under the purchase-and-sellback option, the area is rezoned for the desired land use and then sold for development. Under the purchase-and-leaseback option, the area is rezoned, and may also be re-subdivided, by the

local government and individual lots are leased for development.

Both options entail substantial capital and transaction costs for the initial purchase of the property and subsequent sales or leases. Under the purchase-and-sellback option, the capital costs are recouped through subsequent sale. Under the purchase-and-leaseback option, initial capital costs are recovered over a longer period of time as annual lease payments are made. The property taxes foregone by fee-simple acquisition and retention are recovered fully under the purchase-and-sellback option. Under the purchase-and-leaseback option, only improvements on the property would likely be subject to ad valorem taxes. The purchase-and-leaseback option has the advantage of allowing the local government to subsequently alter the allowable uses further when the leases are renewed, without legal liability.

Use of the purchase-and-leaseback option for protecting natural protective features is discussed briefly in Section 5.3. Purchase-and-sellback and purchase-and-leaseback have potential pre-disaster and post-disaster applications for reducing allowable densities in hazardous coastal areas as discussed in Section 5.5. For more information see Santa Barbara County Department of Planning and Development (2002) and Gibbons (1999).

## **Purchase of development rights and other easements**

Purchase of an easement involves acquisition of some, but not all, of the bundle of rights that attend ownership of land. The owner retains title to the land but sells some of the rights to the purchaser. Permanent easements become part of the title and “run with the land,” that is they are binding on future owners as well. Temporary easements are for a fixed period of time and usually only apply to the current owner.

Easements may be “affirmative” or “negative.” Affirmative easements purchased by government often grant the public some limited use of the land, such as the right to cross the land to gain access to the beach, or the right to fish along the shores of a water body. Negative easements constrain the owner’s use of the property, for example an easement that requires the landowner to preserve a sensitive environmental feature or aesthetic quality.

Purchase of development rights (PDR) involves purchase of a negative easement that precludes some or all development of the parcel. Often PDR is used for agricultural or timber land under terms that allow continued use of the property and continued occupancy of existing residential structures but which preclude future subdivision and development. As with other easements, PDR may be temporary or permanent. The capital costs of PDR may be 50 percent or more as much as those for outright fee-simple acquisition, although

the maintenance costs may be lower, and not all property tax revenues are foregone.

Pre-disaster hazard mitigation and post-disaster redevelopment applications include use of negative easements and PDR to maintain natural protective features and to restrict development or redevelopment of hazardous areas (see Sections 5.3 and 5.5).

## **Transfer of development rights**

Transfer of development rights (TDR) involves the sale of development rights from one property parcel to the owner of another parcel, thereby allowing more intense development on the second parcel. Typically the government will define both “sending” areas and “receiving” areas.

TDR programs may be voluntary or mandatory. With a voluntary program, property owners within the sending area may choose to sell development rights to buyers in the receiving area. This is analogous to voluntarily selling a negative easement. Under a mandatory program, the sending area is down-zoned (if the TDR program is added to an existing zoning system), and the property owners are compensated for their loss of economic value by the ability to sell their development rights to property owners within one or more receiving areas.

In either case, the receiving area is rezoned to permit development at higher densities than allowed under the base zoning if the property owner purchases development rights from the

sending area. In some cases, development credit banks or exchanges have been created to buy and sell development credits, thereby assuring a buyer for all property owners located in the sending area (a so-called “active” TDR system).

There is not necessarily a one-for-one correspondence between sending units and receiving units. For example, under the TDR program in Montgomery County, Maryland, which was established to limit development of agricultural land, a would-be developer in the receiving area is allotted one residential unit credit for every 5 acres of farmland that are restricted from development.

Mandatory TDR programs can avoid the constitutional takings constraints of down-zoning (see Sidebar 5.1), and possible claims under Florida’s Bert Harris Act (see Sidebar 5.2), if the affected property owners in the sending area can be assured of an adequate price for their lost development rights through creation of a development credit bank or exchange. Transaction costs, however, can be substantial, especially when a development credit bank or exchange is established.

The principal potential hazard mitigation application of TDR is to restrict new development altogether or to reduce the allowed development density within hazardous areas. A more detailed discussion of such pre-disaster applications is presented in Section 5.5. Model zoning regulations for a TDR program are presented in Appendix C-4 (see Sidebar 5.3).

## Capital expenditure policies and programs

Local government decisions about where and when to provide public facilities and infrastructure can substantially influence the location, timing, and intensity of development. Those facilities that have the greatest impact on development patterns are roads, water supply, and wastewater collection and treatment systems. Thus, public spending policies and the decisions embodied in the annual capital

budget and the five-year capital improvements plan in the *capital improvements element* of a community’s *Comprehensive Plan* can be used to direct new development away from hazardous areas.

There are constraints, however, to the effective use of capital expenditure policies. In many instances, local governments do not have direct or exclusive control over the provision of roads, water, and sewer services. Decisions about state and federal highway projects are not subject to direct local control, and water and sewer services may be provided by independent utilities or quasi-independent enterprise operations.

In Florida, concurrency rules require local governments to ensure that public facilities and services “are available when needed for... development” (§163.3202(2)(g), *Florida Statutes*). Thus, capital expenditure policies will be most effective where they are coupled with other growth management tools such as subdivision and zoning ordinances that directly control the density and intensity of allowable land uses.

The *capital improvements element* of a community’s *Comprehensive Plan* also may include capital expenditure policies that articulate a community’s intentions to design and construct public facilities and infrastructure to be more resistant to disaster forces through elevation, flood proofing, hardening, or relocation.

Capital expenditure policies may be applied both to the provision of new services and to decisions about reconstructing public facilities

### Sidebar 5.3

## Model Zoning Regulations for a Transfer of Development Rights (TDR) Program

Model zoning regulations for creating a fully operational TDR program are presented in Appendix C-41. The model regulations designate the density at which dwellings can be built in the TDR sending area and the base density of the receiving area, and they detail how much the density can be increased when development rights are transferred in. Other technicalities—what constitutes an eligible sending parcel, how to certify the transfer of the development rights—are also covered.

and infrastructure in post-disaster situations. Specific applications are discussed in Sections 5.3, 5.4, and 5.5.

### **Financing capital and operating costs of emergency management services**

Florida communities have five principal options for generating local revenue for financing the capital expenditures and ongoing costs of providing emergency management services associated with coastal storms and associated flooding: (1) general taxes, (2) sale of bonds, (3) special assessments, (4) exactions, and (5) impact fees. Descriptions of each of these revenue sources follow.

The principal applications to flooding and coastal storm hazards include the following:

- financing the capital and operating costs of evacuation and sheltering services and other response and recovery costs as detailed in Section 5.2;
- financing the purchase of development rights and other easements as well as acquisition of land in fee simple for the various applications of these strategies that are described in Sections 5.3 and 5.5; and
- financing the maintenance and restoration of beach and dune systems and the construction and maintenance of erosion and flood control structures as described in Section 5.3.

### **General taxes**

General taxes, such as property taxes and sales taxes, are the principal source of local revenue that has traditionally funded regular government services. In some communities, general taxes also are the primary source of revenue for capital expenditures for land acquisition, construction of new facilities, and purchase of equipment. General taxes also are typically the source of funds that have been used to finance general-purpose or special-purpose contingency or “rainy day” funds that are relied upon to cover the local share of emergency response and recovery costs.

There is, however, no direct connection between the tax and the consumption of specific government services; thus this method of financing can be viewed as inequitable where different property owners receive significantly different benefits. Where general tax revenues are used for financing evacuation and shelter facilities and infrastructure, property owners who live in low-risk areas subsidize those in high-risk areas. Use of general tax revenues for these purposes also results in fewer resources for meeting other community needs.

### **Bonds**

Communities often sell bonds to borrow funds for capital projects. Doing so avoids some of the opportunity costs of using general tax revenues. Two principal types of bonds are employed: (1) general obligation bonds and (2) revenue bonds.

General obligation bonds issued by local governments are typically secured by ad valorem property taxes. Where this is the case, borrowing money does not resolve the tax benefit equity concerns of subsidizing property owners who choose to develop land in high-risk areas, unless the bonds are sold to finance improvements within a special assessment district (see next section).

Revenue bonds are secured by a dedicated revenue source other than the community’s ad valorem tax base. These may include revenues such as user fees generated from the project financed by the bonds (for example, airport, convention center, toll road/bridge, water, or sewer revenue bonds), impact fees (see below), or other local taxes and fees excluding ad valorem property taxes. Revenue bonds may avoid the tax benefit equity issue if the revenue source used to finance the bonds is collected only from those who benefit from the capital improvements.

### **Special assessments**

Special assessments are typically levied on real property in districts that are created within a local jurisdiction to finance specific public capital improvements or the annual operating costs of services that confer a special benefit to the properties within the district. Assessments must vary in proportion to the benefits consumed by the individual property. These provisions can help to remedy the tax benefit

equity limitations of general taxes and general obligation bonds.

The Florida law governing special assessment authority is complicated and differs for counties and cities (see Deyle and Falconer, 2003).

- Counties are explicitly authorized to create special assessment districts to provide capital infrastructure, facilities, and services, including major capital improvements such as, but not limited to, transportation facilities, sanitary sewer facilities, solid waste facilities, water management and control facilities, potable water facilities, alternative water systems, educational facilities, parks and recreational facilities, health systems and facilities, and, dredge spoil disposal sites (§§189.402(3)(a) and 189.403(7), *Florida Statutes*).

Counties also may create municipal service benefit units (MSBUs) for the provision of the following services (§125.01(1) (q), *F.S.*): fire protection, law enforcement, beach erosion control, recreation service and facilities, water, streets, sidewalks, street lighting, garbage and trash collection and disposal, waste and sewage collection and disposal, drainage, transportation, indigent health care services, mental health care services, and other essential facilities and municipal services.

- Cities are authorized to levy special assessments for funding capital improvements and municipal services, including, but not limited to fire protection, emergency medical services, garbage disposal, sewer improvement, street improvement, and parking facilities (§170.201(1), *F.S.*).

The potential for using a risk-based special assessment for financing local government capital and operating costs associated with hurricane vulnerability is discussed in Section 5.2.

### Exactions and dedications

Exactions require that developers provide, or pay for, some public facility or other amenity as a condition for receiving development permission. Typically subdivision and PUD regulations require developers to dedicate land for and provide facilities such as streets, sidewalks, water and sewer lines, and drainage facilities. For facilities such as schools and parks, developers may be given the option of constructing and dedicating the needed facilities within the subdivision, dedicating land for the facility, or making payments in-lieu of providing the facility within the subdivision. Developers also may be required to dedicate conservation easements to protect sensitive natural features or open space.

Principal applications of exactions in the context of hazard mitigation include providing or financing evacuation and sheltering facilities and infrastructure (see Section 5.2) and dedica-

tion of easements for preserving natural protective features such as wetlands, floodplains, and beaches and dunes (see Section 5.3). These are predominantly pre-disaster applications except in the unusual event of re-subdivision of land after a disaster.

### Impact fees

Impact fees are a type of exaction used to expand or improve public facilities outside a subdivision or PUD. They are one-time charges levied on developers to cover the proportional share of the capital cost of facilities needed to serve the new development. In Florida, impact fees must meet two criteria established by the state courts:

- the local government must demonstrate a reasonable connection between the need for additional capital facilities and the growth in population generated by the subdivision; and
- the local government must show a reasonable connection between the expenditures of the funds collected and the benefits accruing to the subdivision.

In order to satisfy the second requirement, the ordinance establishing the impact fee must specifically earmark the funds collected for use in constructing capital facilities to benefit the new residents.

In the context of hazard mitigation, impact fees are most likely to be useful for financing

evacuation and sheltering facilities and infrastructure as discussed in Section 5.2.

### State and federal grant funds

A number of state and federal programs are available for floodplain acquisition and elevation projects and for mitigation projects for existing public buildings and critical facilities to finance the retrofit or relocation to make them more resistant to the impacts of disasters.

### Education and information

Education and information programs can be valuable supplements to local government programs that help promote desired behavior among target groups, whether the government initiatives are regulatory or voluntary in nature. Education and information initiatives can be a valuable component of each of the four strategies for reducing community vulnerability to coastal storms and associated flooding. Examples are described in each of the following sections.

Sara Nathe and others, in their 1999 article “Public Education for Earthquake Hazards,” list several principals of effective communication:

- explain complicated phenomena in non-technical terms;
- make sure information comes from multiple credible sources;
- repeat information in multiple and different media;

- tell people what they can do with the information they receive;
- give people opportunities to confirm and validate the information with their peers; and
- do not rely exclusively on electronic media; people need to be able to refer back

to the information when decision circumstances arise.

Sidebar 5.4 illustrates how these principals can be put into practice in a hypothetical example of a city public education program designed to promote voluntary flood hazard mitigation initiatives by private property owners.

#### Sidebar 5.4

### Model Natural Hazard Public Education Program

The Emergency Management Institute's instructor's guide for an emergency management course entitled “Building Disaster Resilient Communities” (2002) presents a summary of an ideal city public education program concerning flood hazards.

This particular example is focused on structural mitigation and thus is most relevant to the best practices described in Section 5.4, “Making Structures More Resistant to Natural Hazard Forces”:

1. Written material is produced in attractive, well-illustrated and clearly explained brochures that describe the hazard in each district and exactly what homeowners and businesses can do to reduce their vulnerability.
2. Potential costs of not doing anything are expressed as benefits – future savings in property and safety.
3. A series of public workshops is scheduled to discuss the information in the brochure. These are targeted at specific areas of the city that are vulnerable to flood hazards.
4. At each workshop, a local resident, who has had experience with previous flood events, is asked to comment on the staff's presentation and to help facilitate response to questions from the audience. Programs available to assist property owners, and next steps they can take, are clearly identified in the workshop.
5. Press kits are prepared for the radio, TV, and print media. These include a copy of the brochure and a press release about the campaign and the upcoming workshops. The press kits also include old news stories on previous flood emergencies in the city and state and a list of local government specialists who are available to answer reporters' questions.

## Section 5.2: Provide Evacuation and Sheltering Services

As noted in Section 2.3, most Florida counties provide evacuation and sheltering services to their residents. However, current evacuation clearance times and shelter capacities are inadequate in many parts of the state. Coastal cities and counties are required to include an objective in their *Comprehensive Plans* to “maintain or reduce hurricane evacuation times,” and they are directed to include an analysis of measures the local government could adopt to achieve that objective.

As more shelters become available, less people will need to evacuate, thus reducing the congestion on the evacuation road network. Therefore, communities essentially have two strategic options for maintaining or reducing evacuation clearance times and assuring the provision of adequate shelter capacity:

- attempt to influence demand for evacuation and shelter services; and/or
- increase the capacity of available evacuation and shelter infrastructure and facilities.

The demand for evacuation and shelter services can be maintained or reduced through the use of land use planning and development management tools for guiding development and redevelopment in hazardous areas, including the following:

- zoning regulations;
- overlay districts;
- subdivision and PUD regulations;
- cluster development;
- fee-simple property acquisition;
- purchase and leaseback;
- purchase of development rights and easements;
- transfer of development rights; and
- capital expenditure policies and programs.

These tools also serve to reduce the number of people, the amount of private property, and numbers of public facilities that are exposed to natural hazards. Specific applications of these tools are described in Section 5.5.

Local governments have the option of making hurricane evacuation capacity a concurrency requirement. For example, Monroe County established a Rate of Growth Ordinance (ROGO) based on the ability to safely evacuate the Florida Keys. The state- approved *Comprehensive Plan* determined that 2,550 new residential units could be allocated while maintaining the 24 hour evacuation standard adopted in the plan. Monroe County set a 10-year allocation of 255 units per year. Walton County has similar provisions in its *Comprehensive Plan*, which require that, for development within any hurricane evacuation zone, a 12-hour clearance time needs to be maintained for a Category 3 storm (Policy C-4.2.5). Development projects of 400 or more dwellings are required to submit an analysis of hurricane evacuation impacts, to

determine whether the adopted standard would be met.

In addition, public education and information initiatives may be used to reduce unnecessary evacuation by people who live outside of areas for which evacuations may be declared for a given storm threat or who live in structures that are not vulnerable to anticipated storm forces. These initiatives are typically undertaken within the realm of county emergency management preparedness operations and are not covered by *Local Mitigation Strategies* or *Comprehensive Plan* policies.

While the objective is to remedy deficiencies or to maintain current levels of service while allowing additional growth, the alternative strategy of increasing the capacity of evacuation infrastructure and emergency shelters can be achieved by using various tools for financing the operational costs of planning and providing evacuation and shelter services and the capital costs of evacuation infrastructure and hurricane shelters.

Emergency shelters in Florida are predominantly located in public school buildings and are operated as shelters by the American Red Cross under contracts with the counties. Some new shelter capacity is being created when county school districts, community colleges, and state universities build new school facilities. Funding for this construction is derived from existing state capital outlay funds. However, retrofitting of existing school buildings is a major part of the state’s strategy for reducing

current shelter deficits. These projects are frequently undertaken by counties, in collaboration with their school districts (see Sidebar 5.5).

Tools for financing the capital costs of such retrofit projects and for expanding evacuation infrastructure are described in this section as

#### Sidebar 5.5

### State Shelter Retrofit Report and Shelter Plan

The State of Florida's 2003 **Shelter Retrofit Report** presents findings from the state's on-going survey of existing emergency shelters and reports on progress made in constructing new Enhanced Hurricane Protection Area (EHPA) shelters. It also details the state's strategy for remedying the current shelter deficit. The report can be accessed online at <http://floridadisaster.org/bpr/Response/engineers/documents/03ShelterRetrofit.pdf>.

The **State of Florida 2004 Statewide Emergency Shelter Plan** provides information on existing and long-term hurricane evacuation shelter space requirements and determines which regions and counties are required to construct new educational facilities to comply with the state's public shelter design criteria. The plan is available at <http://floridadisaster.org/bpr/Response/engineers/documents/2004SESP/2004%20SESP%20COMPLETE.pdf>.

well as tools for financing the annual operating costs of maintaining shelters and evacuation infrastructure, planning and preparing for evacuation, and the actual costs of evacuation and sheltering when a coastal storm threatens or strikes a community. With the exception of procuring grants from the federal or state governments, these are predominantly pre-disaster initiatives. They include the following:

- levy of general taxes;
- bond sales;
- imposition of exactions, dedications, or impact fees;
- special assessments;
- risk-based special assessments; and
- procurement of state and federal grant funds.

#### Finance maintenance and/or increase in service supply

Local governments face three categories of costs associated with the provision of evacuation and shelter services:

- capital costs of expanding or constructing new public shelters and evacuation infrastructure (roads, bridges, and causeways);
- annual operating costs of maintaining shelters and evacuation infrastructure and planning and preparing for evacuation; and
- response and recovery costs associated with actual evacuations when coastal storms threaten the jurisdiction and costs

of repairing shelters and evacuation infrastructure damaged during a disaster.

Capital costs can be financed with local revenues and grants from state and federal government. Annual operating costs of facilities maintenance, planning, and preparedness are typically funded from local revenues. If a community is included within a presidential disaster declaration, it may be eligible for state and federal public assistance that will cover up to 87.5 percent of response and recovery costs, including evacuation and shelter operation. The balance (12.5 percent) must be covered from local funds. Where evacuations are ordered, but the community is not included in a presidential disaster declaration, the local government typically must cover all of the costs of evacuation and shelter operations.

#### Financing capital costs

Options for financing the capital costs of expanding evacuation and shelter capacities include the following:

- **General tax revenues.** As discussed in Section 5.1, these consist primarily of property tax and sales tax revenues. Where general tax revenues are used for financing evacuation and shelter facilities and infrastructure, property owners who live in low-risk areas subsidize those in high-risk areas.
- **Bond sales.** Also as noted in Section 5.1, where communities sell general obligation

bonds to raise revenues for evacuation and shelter capital expenditures, borrowing money does not resolve the tax benefit equity concerns of subsidizing property owners who choose to develop land in high-risk areas unless the bond sales are part of a special district financing strategy. Where communities sell revenue bonds, the tax benefit equity issue can be remedied if the revenue source used to finance the bonds is collected only from those who consume the evacuation and shelter services. This could be accomplished if the bonds are paid off from revenues derived from an impact fee or special assessment.

- **Exactions, dedications, and impact fees.** Several jurisdictions in Florida levy fees or other exactions on developers for the construction of new shelters. This assures that new shelter space is available to serve the new residents.
  - Hillsborough County, which relies primarily on its public school system for emergency shelters, assesses an **exaction** through its subdivision process that generates funds for the school district to use for providing additional shelter capacity (see Sidebar 5.6).
  - Several other Florida jurisdictions, including the City of Jacksonville and Hernando, Lee, and Pasco counties, employ similar **exactions/impact fees** to finance new shelter space.

#### Sidebar 5.6

### Hillsborough County, Florida: An Exaction for Shelter Space

Hillsborough County levies an exaction on new residential developments to cover the costs of providing additional emergency shelter space in the public school system through the retrofit of existing school facilities. The mitigation-offset exaction fee is conveyed by the county to the Hillsborough County School Board to be used solely for their public-shelter retrofit projects.

The following formula is used to calculate the mitigation-offset fee to be paid for a given residential development:

1. Number of dwelling units (x) 2.5 (*occupancy factor*) = the number of potential evacuees.
2. Number of potential evacuees (x) 0.25 (*historical public shelter demand*) = shelter space demand.
3. Shelter space demand (x) \$129.00 = shelter impact mitigation-offset cost.

The \$129 cost per space is the amount that local and state agencies are currently paying to mitigate the existing shelter deficit.

- Model language from the City of Jacksonville **Comprehensive Plan** for such an **exaction** system is presented in Sidebar 5.7.
- The City of Bonita Springs, in Lee County, Florida, offers developers several options for offsetting increases in the need for shelter and evacuation capacity that result from new residential development. These include **dedications** of land for offsite or onsite shelters, **payments in lieu** of dedications, **exactions** for evacuation services, and **design concessions** that allow for in-place sheltering (see Sidebar 5.8).
- Escambia County imposes an **impact fee** for shelter space on mobile home parks and RV parks.

Impact fees could be used to help finance evacuation infrastructure, for example, increases in the capacity of roads, bridges, and causeways along evacuation routes. However, to do so, the local government would have to devise a fee structure that meets the state courts' requirements that the fee be in proportion to the benefit provided to the new residents of a subdivision (see Section 5.1).

- **Special assessments for evacuation and shelter services.** As noted in Section 5.1, special assessments are levied on improved property parcels in a designated area as the basis for financing capital and

## City of Jacksonville 2010 Comprehensive Plan: Conservation/Coastal Management Element (February 2003)

The **Comprehensive Plan** of the City of Jacksonville contains explicit policies for increasing shelter space to serve residents in the coastal high-hazard area (CHHA). Policies 7.2.5, 7.2.6, and 7.2.7 recognize that dense residential development in the CHHA puts a strain on existing shelter assets. These policies ensure that developers finance the cost of retrofitting one shelter space for each new occupant of a medium or high density residential development within the CHHA. All the units in developments that are partially or completely within the CHHA are included when calculating the assessment. Low density residential development is not required to contribute to the Shelter Assessment Fund, but is subject to numerous policies which restrict incompatible uses, encourage clustering, and limit infrastructure.

### **Issue: Providing Hurricane Shelter**

*The City currently has a deficit in State ARC 4496 design criteria-compliant shelter spaces of over 12,000. The Emergency Preparedness Division, the Planning and Development Department and the Duval County School Board are working to retrofit schools to reduce the deficit. It is the City's intent to monitor the relationship between population growth and shelter capacity to ensure the provision of additional shelter spaces, as determined to be necessary. Further, the City will continue to assist in the emergency preparedness requirements of its people with special needs.*

*Objective 7.2 Adequate shelter space shall continue to be available for the population in the Hurricane Evacuation Zones at risk under a Category 3 storm event. The City, acting as*

*Duval County, shall have a mechanism in place to assist in providing shelter and transportation for people with special needs during an emergency.*

### **Policies**

*7.2.1 The City, acting as Duval County, shall increase its shelter capacity. All new or retrofit school projects shall be evaluated for sheltering of special needs as well as general populations.*

*7.2.2 The Chief of Emergency Preparedness, with assistance from State and regional agencies, shall establish the target shelter demand, and make recommendations on additional policies and strategies to ensure, if needed, the availability of additional shelter space.*

*7.2.3 In the event that the Chief of Emergency Preparedness determines that the shortage of shelter space requires mitigation, then policies 7.2.5, 7.2.6 and 7.2.7 shall apply.*

*7.2.4 The Emergency Preparedness Division shall, for evacuation purposes, continue to identify the special needs population of Duval County, and plan for appropriate facilities and services through the Duval County Health Department, with the assistance of such government and quasi-government agencies as the Northeast Florida American Red Cross, the First Coast Hospital Disaster Planning Council, and other similar agencies.*

*7.2.5 The City shall require that all new development located in the Coastal High Hazard Area in land use categories that permit*

*residential density greater than Low Density Residential shall contribute to the cost of emergency shelter space in existing school sites.*

*7.2.6 For purposes of determining an owner's assessment for the cost of emergency shelter space in existing school sites, the City shall use a quantitative formula where:*

*A equals the total number of residential units proposed;*

*B equals number of persons per household; and*

*C equals average cost to retrofit one shelter space;*

*D owner's assessment*

*A X B X C = D Owner's Assessment*

*7.2.7 The City shall use the most recent U.S. Census data related to average household size, population in households and households. In calculating the assessment owed, the City shall use the full unit count of the proposed development, the county-wide average household size from the U. S. Census, and the average shelter retrofit cost as provided by the City's Emergency Preparedness Division in consultation with the Duval County School District Facilities Services Division. The City shall not allow a reduction of the shelter space required based on assumptions of smaller household sizes than the county-wide census data or reduced uses of public shelters for certain developments. These factors shall be updated as warranted by the City to ensure accuracy of costs and population factors.*

operating costs for a specific service or other public amenity that directly benefits the property. Emergency management services, such as planning and preparedness for evacuation and sheltering, and the capital facilities and infrastructure required to provide those services, are not explicitly listed as services for which special assessment districts may be created.

However, a recent review of state statutory and case law indicates that a special assessment for such services appears to be consistent with the powers delegated to local governments in the state (see Deyle and Falconer, 2003).

- **Risk-based special assessments.** A special assessment district is not needed unless

(a) there are some areas of a jurisdiction for which there is no need for evacuation and shelter services, or (b) there is a basis for assessing consumers of these services at different rates. Because evacuation frequencies are based primarily on the location of a property parcel (see Figures 3.2 and 3.3), it is feasible to levy an annual assessment that varies by the evacuation zone within which a property parcel is located and the annual probability that a structure on the parcel will be evacuated. Researchers with the Florida Planning and Development Lab at Florida State University devised a risk-based assessment mechanism for Lee County, Florida, that encompasses both the operating and capital costs associated with on-going planning, preparedness, and mitigation, as well as the event costs associated with evacuation, response, and recovery (see Sidebar 5.14).

- **State or federal grant funds.** Three principal sources of capital are available from the State of Florida and the federal government that can be used for installing shutters and making other structural retrofits to existing public buildings for use as shelters. These include funds from the state **Shelter Retrofit Program** (see Sidebar 5.9), the federal **Hazard Mitigation Grant Program** (see Sidebar 5.10), and the federal **Pre-Disaster Mitigation Grant Program** (see Sidebar 5.11).

#### Sidebar 5.8

### Bonita Springs Shelter and Evacuation Impact Ordinance

The purpose of city Ordinance No. 01-16 is “to address the impact created by residential development on hurricane shelter availability and evacuation capability in the City of Bonita Springs. These regulations are intended to mitigate the growing hurricane shelter deficit, along with related effects on evacuation times and infrastructure, caused by permitting residential development without addressing the incremental impact on the city’s hurricane preparedness program.” The ordinance applies to residential development “located in a landfalling category 1, 2, or 3 storm surge area” and “to new and existing developments of regional impact.”

Developers have a range of options to choose from for mitigating shelter and evacuation impacts. The option has to be approved by the city. Shelter impacts can be addressed through the donation of land or the use of a private

structure, payment in lieu of donation of land or use of a private structure, or provision of on-site shelter within the development. Evacuation efficiency improvements can be addressed by paying an exaction that “may be used for items such as:

- a. Communications equipment to convey real time conditions to the public on the roadways.
- b. Information systems along major arterial evacuation routes to convey emergency information.”

Mitigation options that address both shelter and evacuation impacts include the construction of safe rooms in houses and the elevation of houses above hurricane flood-levels (see section 5.4).

## Sidebar 5.9

## Florida Shelter Retrofit Program

In 1999 and 2000, the State of Florida committed state and federal funds to remedy its emergency shelter deficit. Each year, county emergency management officials in cooperation with local American Red Cross (ARC) chapters, school boards, and other public and private agencies, submit proposals for retrofitting existing public buildings to meet the ARC's **Guidelines for Hurricane Evacuation Shelter Selection**. Proposals are reviewed by the DEM, and submitted to the Governor and the State Legislature for funding. For more information, see the state's 2003 **Shelter Retrofit Report** at <http://floridadisaster.org/bpr/Response/engineers/documents/03ShelterRetrofit.pdf>.

## Sidebar 5.11

## Federal Pre-Disaster Mitigation Grant Program

The Pre-Disaster Mitigation (PDM) grant program was authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by Section 102 of the Disaster Mitigation Act of 2000, to assist communities to implement hazard mitigation programs designed to reduce overall risk to the population and structures before the next disaster occurs. This is a competitive grant program administered through the Florida

## Sidebar 5.10

## Federal Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 93-288 as amended). It is a partnership designed to assist states, local governments, private non-profit organizations, and Indian Tribes in implementing long-term hazard mitigation measures following a major disaster declaration.

The objectives of the program are:

- to prevent future losses of lives and damage to property due to disasters;
- to implement state or local hazard mitigation plans;
- to enable mitigation measures to be implemented during immediate recovery from a disaster; and

- to provide funding for previously identified mitigation measures that benefit the disaster area.

The HMGP can fund up to 75 percent of the costs of mitigation measures to protect public or private property, as long as they are in compliance with the program's guidelines. Applicants must provide 25 percent match in the form of cash, in-kind services, or materials. Although the program is federally funded, it is administered through a partnership arrangement with the Florida Department of Community Affairs. The Division of Emergency Management is the lead state administrative agency. A FEMA-approved state and local mitigation plan is required to receive project funding, and the project must conform to the priorities established in the **Local Mitigation Strategy**.

For more information see <http://www.floridadisaster.org/brm/hmgrp.htm>.

Division of Emergency Management. Eligible projects include the following:

- property acquisition or relocation;
- structural and non-structural retrofitting (e.g., elevation, storm shutters and hurricane clips);
- minor structural hazard control on protection (e.g., culverts, floodgates, retention basins); and

- localized flood control projects that are designed to protect critical facilities and are not part of a larger flood control system.

A FEMA-approved state and local mitigation plan is required to receive project funding, and the project must conform to the priorities established in the **Local Mitigation Strategy**. For more information see [http://www.floridadisaster.org/brm/PDM/PDM\\_main.htm](http://www.floridadisaster.org/brm/PDM/PDM_main.htm).

### Financing operating costs

Local governments have two principal options for financing the annual operating costs of maintaining shelters and evacuation infrastructure and for planning and preparing for evacuation: (1) general tax revenues and (2) special assessments. To the extent that these services are differentially consumed by property owners in high-risk areas, use of general tax revenues for such purposes is inequitable. Special assessments based on relative risk (see above) offer an alternative that avoids this inequity.

### Financing response and recovery costs

Some categories of response and recovery costs are eligible for reimbursement under the federal Public Assistance Program (see Sidebar 5.12) when a community is covered by a presidential disaster declaration. The federal share is 75 percent, and in Florida, the state will cover half the balance, leaving the local government responsible for 12.5 percent of eligible costs. The exception is mitigation projects, for which the local government must pay the full 25 percent non-federal share. There are some costs, however, associated with disaster response and recovery, for which the local government is entirely responsible.

Some communities create “rainy day” or contingency funds to cover such circumstances. These are often funded from general tax revenues, and, therefore, may be viewed as inequitable where these funds are more likely to

#### Sidebar 5.12

### Federal Public Assistance Program

Public Assistance is that part of disaster relief through which the federal government supplements the efforts of state and local governments to return the disaster area to pre-disaster conditions. Eligible categories of expenses include the following:

#### Category A

**Debris Clearance:** This category includes all storm-induced debris on non-federal public roads, including the right-of-way, non-federal public waterways, other public property, and private property when undertaken by local government forces. It can also cover the cost of demolition of public structures if those structures were made unsafe by the disaster.

#### Category B

**Emergency Protective Measures:** This category addresses the need to provide appropriate emergency measures designed to protect life, safety, property, and health (i.e., barricades, sand bags and safety personnel).

#### Category C

**Road System:** This category addresses damages to non-federal roads, bridges, streets, culverts, and traffic control devices.

#### Category D

**Water Control Facilities:** Eligible damages under this category include costs to repair or replace dikes, dams, drainage channels, irrigation works, and levees.

#### Category E

**Building and Equipment:** Eligible damages under this category include costs to repair public buildings and equipment, supplies/inventories that were damaged, and transportation systems such as public transit systems.

#### Category F

**Public Utility Systems:** Under this category, assistance is available for damaged water systems, landfills, sanitary sewerage systems, storm drainage systems, and light/power facilities.

#### Category G

**Other:** The “other” category includes park and recreational facilities, or any other public facility damages that do not reasonably fit in one of the other six categories.

For more information see <http://www.floridadisaster.org/brm/Public%20Assistance.htm>.

be spent in high-risk areas of the community. Using general tax revenues for such purposes also entails opportunity costs for other public purposes that are not funded. Lee County, Florida, created an “All Hazards Protection District” to generate revenue for mitigation and recovery (see Sidebar 5.13). The Lee County

special assessment avoids the opportunity costs of using general tax revenues for mitigation and recovery, but because it levies a fixed assessment on all property, it does not address the equity issue.

A risk-based special assessment that covers all response and recovery costs would offer an

alternative that is more equitable (see Sidebar 5.14). Sarasota County has established a more narrowly targeted special assessment district that is used to fund repairs to a single road that is prone to storm erosion damage (see Sidebar 5.15). This assessment district is more equitable because it taxes those property owners

#### Sidebar 5.13

### All-Hazards Protection District – Lee County, Florida

Lee County officials took notice after Hurricane Hugo hit South Carolina in 1989. They recognized that they could experience very substantial costs for recovery from a similar disaster and that they needed funds to finance the capital costs of mitigation measures that would reduce their vulnerability to hurricane damage. The county created an All Hazards Protection District in the unincorporated areas of the county that levies a property tax of \$5 on every \$100,000 of assessed value to be used for emergency management and mitigation. The assessment generates about \$900,000 yearly. The county sets aside 25 percent of those revenues in a contingency fund to help cover the local share of disaster response and recovery costs that would not be covered by federal and state assistance.

#### Sidebar 5.14

### A Risk-Based Assessment for Emergency Management Services

Researchers with the Florida Planning and Development Lab (FPDL) devised a risk-based assessment mechanism for Lee County, Florida, based on a set of risk indices that can be applied to four cost categories:

- an **anticipatory protective measures index** applied to costs associated with Category B expenditures under the federal Public Assistance Program (see Sidebar 5.12) - based on the annual probability that a given improved property parcel will be evacuated for a hurricane;
- a **damage risk index** applied only to property parcels with structural improvements for costs associated with debris clearance (Category A) - based on the vulnerability of the structure to damage from wind, waves, and storm surge flooding;

- a **public facilities risk index** applied to Category C-G costs – based on the square footage of the structural improvements on the property; and
- an **ongoing services risk index** applied to on-going planning and preparedness operating costs and mitigation capital costs – based on a combination of the other three indices.

FPDL estimated that such an assessment would raise between \$1.2 and \$1.7 million a year, if levied in 1995 in unincorporated Lee County. After paying annual operating costs of approximately \$718,000, the special assessment would generate sufficient revenues for a contingency fund to cover the 1995 predicted local costs of a Category 2 hurricane (\$2.2 million) in 3 years. At that rate, it would take about 7 years to raise sufficient revenues to cover the estimated local response and recovery costs of a Category 3 hurricane (\$5.0 million).

Source: Florida Planning and Development Lab, *The Costs of Hurricane Emergency Management Services: A Risk-Based Method for Calculating Property Owners' Fair Share*, 2003.

#### Sidebar 5.15

### Sarasota County Special Assessment District for Storm Damage Repairs

Sarasota County created a special assessment district in 1988 on the Casey Key barrier island to pay for revetment construction to protect a segment of North Casey Key Road and to pay for future repair and reconstruction of the revetment and the roadway. Property owners in the district are assessed on an ad valorem basis as necessary to retire bonds that are issued and to finance other expenses of the district.

ed runoff can be detained. The natural vegetation of these areas helps to reduce storm water flow rates and minimize soil and bank erosion (see Figure 5.1).

- Coastal wetlands help to dampen the flow of storm water runoff from uplands to coastal waters and provide buffer areas that can absorb storm surge flooding and dampen wave energy associated with coastal storms (see Figure 5.2).



Source: URS Corporation, 2000.

**Figure 5.1: Protective natural features: freshwater wetlands and floodplains.**

who primarily rely on the road for access to their land.

### Section 5.3: Maintain and Enhance Natural Protective Features

As noted in Section 2.3, natural drainage ways, floodplains, wetlands, beaches, and dunes help to mitigate a community's vulnerability to damage from coastal storms and associated flooding:

- Drainage ways, floodplains, and freshwater wetlands provide space for storm water runoff to flow and areas where accumulat-



Source: URS Corporation, 2000.

**Figure 5.2: Protective natural features: coastal wetlands.**

- Natural beach and dune systems are part of the coastal sediment supply system that adjusts to variations in the wave energy of the coast (see Figure 5.3). During coastal storms, beaches and dunes help to dampen storm wave energy as well as providing physical protection from storm surge. Damage to dune vegetation increases their vulnerability to erosion. Removal of dunes reduces the sand supply of the beach and dune system and makes the entire beach and dune system more vulnerable to erosion and long-term recession of the beach.

State regulations governing local *Comprehensive Plans* contain several directives con-

cerned with the protection of natural protective features.

- All local governments are required to analyze the potential for the conservation, use, or protection of wetlands, estuarine marshes, and floodplains in the *conservation elements* of their *Comprehensive Plans*.
- Specific policies are to be included in the *conservation element* that address protection and conservation of wetlands and their natural functions, and future land uses incompatible with their protection and conservation are to be directed elsewhere.
- Policies are required in the *public facilities and services element* that regulate land use and development to protect the functions of natural drainage features.
  - Coastal communities are directed to include objectives in their *coastal management elements* to protect, conserve, or enhance existing coastal wetlands, and to protect beaches and dunes and restore altered beaches and dunes.
  - Specific *coastal management* policies also are required that limit the direct and cumulative impacts of development and redevelopment on coastal

wetlands, beaches, and dunes and that identify techniques for doing so as well as restoring or enhancing degraded wetlands, drainage systems, beaches, and dunes.

Governments have employed two basic strategies concerning these natural protective features: (1) measures to protect and maintain these systems in their natural state so that they can continue to perform their natural hazard mitigation functions, and (2) measures to enhance and restore the natural protective functions of these systems. Specific land use planning and development management tools used to implement these strategies include the following:

- zoning with overlay districts;
- subdivision and PUD regulations;
- site design regulations and performance standards;
- cluster development;
- incentive zoning;
- setbacks and buffers;
- fee-simple property acquisition;
- purchase and leaseback;
- purchase of development rights and conservation easements;
- transfer of development rights;
- exactions and dedications;
- capital expenditure programs;
- financing capital and operating costs; and
- education and information.

Specific applications are described in the following sections. Typically, use of these tools

**Figure 5.3: Protective natural features: healthy beach and dune system.**



Source: U.S. Army Corps of Engineers

is enabled through policies, contained in the *future land use, conservation, or coastal management elements* of a community's *Comprehensive Plan*, that govern new construction in pre-disaster settings. Some capital projects to enhance natural protective features by constructing or expanding erosion or flood control structures may be eligible for post-disaster federal funding under the Hazard Mitigation Grant Program.

## Protect and maintain natural protective features

Three principal approaches are taken to protect and maintain natural protective features:

1. land use regulation that prevents disturbance of existing natural protective features;
2. land use regulation that employs setbacks to protect buffer areas around the margins of natural protective features; and
3. acquisition of property in fee-simple or acquisition of negative easements that constrain use of property so as to protect the natural protective features.

A fourth strategy, transfer of development rights (TDR), has the potential to be used as well, but to date has been used primarily to protect farmland or other natural features. In addition, education and information initiatives have been widely used to inform the public about the need to protect dunes and dune veg-

etation. Other such initiatives may be undertaken to garner public support for initiatives to protect other natural protective features such as floodplains and wetlands.

### Land use regulation that prevents disturbance of natural protective features

Local regulation of development within wetlands and beach and dune areas in Florida occurs within the context of several federal and state regulatory programs.

- *U.S. Army Corps of Engineers regulation of dredge and fill activities within navigable waters of the United States and adjacent wetlands.* Dredge and fill activities involved in the construction of flood protection and erosion control structures at or below the mean high water line of navigable waters, including beach renourishment projects, and dredge and fill activities in freshwater and coastal wetlands that are adjacent to or tributary to navigable waters are regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act as well as Section 10 of the Rivers and Harbors Act of 1899.
- *State beach and dune regulatory programs.* Local regulations to protect the beach and dune system complement two state regulatory programs administered by the Florida Department of Environmental Protection (FDEP), Bureau of Beaches and Coastal Systems:

- **Coastal Construction Control Line (CCCL) permitting program.** Twenty-seven of Florida's 35 coastal counties are subject to the state's CCCL permitting program, which is designed to protect the beach and dune system from improperly sited and designed structures. Standards that govern the placement, elevation, and construction of habitable structures within the CCCL jurisdictional area serve to reduce the vulnerability of the structures to damage from wind, waves, and storm surge (see Sidebar 5.32 in Section 5.4). This, in turn, reduces the likelihood that damage to the built structures will destabilize or destroy the beach and dune system. The CCCL permitting program supplements the standards contained in the Florida Building Code (see Section 5.4) and local setback and development regulations intended to reduce the vulnerability of private property from coastal storm damage (see Section 5.5).
- **Joint Coastal Permit (JCP) program.** Beach restoration and other erosion control projects, such as the construction of seawalls, groins, and breakwaters, require permits from FDEP as well as the U.S. Army Corps of Engineers. A copy of the JCP application is forwarded to the United States Army Corps of Engineers by FDEP for sepa-

rate processing of the federal dredge and fill permit, if necessary. For more information, see <http://www.dep.state.fl.us/beaches/programs/envpermt.htm>.

- **State wetland regulatory programs.** The State of Florida regulates construction activities in wetlands to prevent degradation of water quality (such as through the loss of wetlands, improper in-water construction techniques, or discharge of inadequately treated storm water runoff), flooding, or degradation of habitat for aquatic or wetland dependent wildlife species. For more information, see <http://www.dep.state.fl.us/water/wetlands/erp/index.htm>.

- **Environmental Resource Permit (ERP) program.** In all areas of the state except the Florida Panhandle (Escambia through Wakulla Counties), construction in and adjacent to wetlands is regulated through an ERPs issued by the water management district, pursuant to delegation of such authority by FDEP. Local governments may petition the FDEP for delegation of some or all of this regulatory authority. Local government regulations can be more, but not less, restrictive than the applicable state regulations.

- **Wetland Resource Permit (WRP) program.** In Florida Panhandle counties, Wetland Resource Permits must be obtained from the FDEP for development actions that disturb wetlands or other waters of the state. These regulations do not apply to “isolated wetlands” that are not connected to surface waters of the state. There are provisions for delegation of this permitting program to local governments.

A number of Florida cities and counties establish conservation or preservation land use categories and include policies in their *Comprehensive Plans* to protect and/or restore natural protective features. All of the land use regulatory tools listed in Table 5.1 can be applied to implementing such policies. A selection of exemplary approaches is described here.

- **Zoning with overlay districts.** A number of communities zone natural drainage ways, floodplains, wetlands, beaches, and dunes as preservation areas. Because the areas encompassed by such features typically do not correspond to property parcel boundaries, communities often use overlay districts to define the areas within which specific zoning restrictions for these features apply.
- **The City of Indian Rocks Beach 2003 Beach Management Plan** recommends amending the city’s Comprehensive Plan to establish a Dune Preservation

Zone and to designate the zone as a preservation area on the future land use map with no associated density.

- **St. Lucie County’s land development code** defines a Dune Preservation Zone within which no development is permitted that would threaten the stability of the frontal dune or beach in front of or adjacent to any parcel of land.

- **Subdivision and PUD regulations.**

- **Longboat Key’s land development code** requires PUDs to set aside 50% of their area for open space (§158.069). The regulations permit inclusion of wetlands in meeting those requirements. This provides an incentive for their protection in addition to the restrictions applied to retain them as storm water retention areas (see Sidebar 5.16).

- **Site design regulations and performance standards.**

- **The Town of Longboat Key** protects wetlands as storm water retention areas through development restrictions applied during the site plan review process (§158.102(G)). The town’s land development code (§158.102(F)(5)) also includes provisions that require developers to preserve, enhance, and

## Sidebar 5.16

### Town of Longboat Key Land Development Code

#### §158.102(G) **Wetland Development Restrictions**

*... No development activity shall be allowed in a wetland area unless “competent evidence” indicates that:*

- 1. Dominant vegetation is no longer comprised of wetland types.*
- 2. The water regime has been permanently altered artificially or naturally in a manner to preclude its associated watershed areas from functioning as wetlands and cannot function as part of the stormwater management system for the site.*

#### §158.102(F) **Open Space and Landscape**

- 5. ... Preserve Natural Landscape, Native Vegetation, and Significant Wildlife Species and Their Habitats.*  
*... Sand dunes and natural landscape barriers fronting on the Gulf of Mexico shall be preserved, enhanced and restored to the greatest extent possible through the land development process.*

#### §158.069 **Open Space**

*All residential planned unit developments shall preserve a minimum of 50% of the gross land area as open space... Wetland and locked water bodies may be used in calculating open space as long as a minimum of 40% of the upland property is comprised of open space...*

*restore sand dunes on properties along the Gulf of Mexico (see Sidebar 5.16).*

- *Walton County’s Comprehensive Plan includes a policy in its coastal management element that establishes a Coastal Protection Overlay Zone within which several site design regulations apply to protect dunes and*

*their natural vegetation (see Sidebar 5.17).*

- *St. Lucie County’s land development code contains a series of development regulations that restrict erosion control structures (§6.02.01(E)(6)), require dune walkovers (§6.02.01(H)(5)), and protect*

## Sidebar 5.17

### Walton County Comprehensive Plan: Coastal Management Element

#### **Objective L-1.5: Protection of Coastal Resources**

*Consistent with the recommendations of the Northwest Florida Coast Resource Management Plan and with the policies of this Comprehensive Plan for Walton County, Coastal Resources shall be protected. The county shall protect, conserve or enhance coastal wetlands, coastal dune lakes, living marine resources, remaining coastal barriers, and wildlife habitats.*

**Policy L-1.5.1:** *The Northwest Florida Coast Resource Management Plan recommends the establishment of a coastal protection overlay zone. The County hereby adopts such a coastal protection overlay zone which extends seaward of the landward toe*

*of the primary dune ridge or, where the toe cannot be determined, fifty (50) feet landward of the crest of the primary dune or twenty-five (25) feet landward of the top of the higher bluff regions where no primary dune exists.*

[Paragraph 2]: *No activities shall be permitted which create erosion of dunes or the dune system. Development within the coastal protection zone shall be limited to elevated boardwalks and other approved fences or structures that will enhance and protect the dune system. Natural dune vegetation within the overlay zone shall be disturbed only to the extent necessary to construct these boardwalks and related structures; however, in no case may more than 10 percent of the existing vegetation or dune be disturbed.*

## Sidebar 5.18

## St. Lucie County Land Development Code

**§6.02.01(D) Vegetation and Landscaping**

*All development is required to comply with the following criteria concerning the preservation of existing native vegetation....*

**1. Selective Clearing and Micro-Siting:**

*All development requiring a County permit shall set aside through selective clearing and micro-siting of buildings, as a minimum, twenty-five (25) percent of each native plant community which occurs onsite... .*

**2. Minimum Disturbance:**

*Existing native vegetation shall be disturbed to the least degree practical.*

**§6.02.01(E) Beach and Dune Protection**

**6. Erosion Control:**

*All development shall comply with the following criteria in order to protect coastal area resources and natural processes within the Beach-Dune Shoreline Area:*

**a. Limitations**

*Erosion control measures shall be limited to those that do not interfere with normal littoral processes, sea turtle nesting and hatching activities, or negatively impact coastal area resources.*

**§6.02.01(F) Dune Restoration**

*All development shall comply with the following criteria concerning site development and maintenance, beach nourishment, and dune height elevations:*

**1. Restoration Requirement:**

*Dune restoration shall be required for development which requires a County permit when the elevation of the existing dune is less than the maximum height elevation specified in Subsection 4.*

**2. Developed Sites:**

*Persons with habitable major structures onsite shall be encouraged to maintain or restore their dune with sand and vegetation to the maximum height elevation specified in Subsection 4.*

**3. Dune Restoration With Beach Nourishment:**

*Dune restoration where needed shall be an integral part of any proposed beach nourishment plan.*

**4. Dune Restoration Height Elevation:**

*All restored dunes, unless otherwise approved by the State, shall have the maximum height elevation specified below:*

- a. one (1) foot greater than the minimum required flood elevation for the subject parcel of land; or*
- b. equal to the height of the adjacent dune.*

*In no case shall the restored dune be less than eight (8) feet in elevation above mean sea level... .*

**§6.02.01(H) Shoreline Access Requirements**

**5. Beach-Dune Shoreline Criteria**

*All new beach access points and beach-front parks shall be provided with dune crossovers. Existing public beach access points shall be provided with dune crossovers as soon as practical to implement this provision.*

**§6.02.03(F) Required Buffering**

*A buffer zone of native upland edge (i.e. transitional) vegetation shall be provided and maintained around isolated wetlands covered by this Section which are constructed or preserved on new development sites. The buffer zone may consist of preserved or planted vegetation but shall include canopy, understory, and ground cover of native species only. The edge habitat shall begin at the upland limit of any wetland or deepwater habitat. As a minimum, ten (10)*

square feet of such buffer shall be provided for each linear foot of wetland or deepwater habitat perimeter that lies adjacent to uplands. This upland edge shall be located such that no less than fifty (50) percent of the total shoreline is buffered by a minimum width of ten (10) feet of upland habitat. The upland buffer requirement does not apply to drainage canals for storm-water conveyance systems requiring periodic maintenance.

#### **§6.02.02 Shoreline Protection**

##### **B. St. Lucie River Shoreline**

###### **2. Development Regulations**

Two zones are hereby created. The boundaries of the zones and the restrictions applying to these zones are as follows:

###### **a. Zone A**

- (1) For a platted lot of record existing as of August 1, 1989, Zone A shall consist of the area from 0 to 50 feet from the mean high water line... or
- (2) When there was no platted lot of record existing as of August 1, 1989, Zone A shall consist of the area from 0 to 75 feet from the mean high water line... .

No development activity or shoreline alteration, including alteration of native vegetation and habitat, shall be permitted, other than that associated with the construction of a private access point, including docks if permissible under applicable laws.

###### **b. Zone B**

Zone B shall consist of the area between Zone A and 300 feet from the mean high water line... .

No development activity that would permit the introduction of any permanent structure that does not comply with the provisions of St. Lucie County's flood damage prevention regulations in Section 6.05.00 of this code is to be permitted.

No road right-of-way (public or private), except for individual driveways, on-site drainage retention pond or system (except for lawfully permitted drainage conveyance outfalls), wastewater lift station, petroleum or chemical storage area, or other activity that would contribute to the degradation of water quality within the North Fork System is permitted.

native dune vegetation (§6.02.01(D)) (see Sidebar 5.18).

- The Monroe County Comprehensive Plan requires 100% of mangroves, freshwater wetlands, and undisturbed salt marsh to be protected as open space (Policy 204.1). Any densities that assigned by the Future Land Use Map to these wetlands need to be transferred out of the wetland area.
- The 2003 Beach Management Plan developed by the City of Indian Rocks Beach recommends several new ordinances that would govern regulation of erosion control structures, requirements for dune walkovers, and removal of exotic plant species from beaches and dunes (see Sidebar 5.19).
- The City of Ocean Ridge protects native dune vegetation through an ordinance that requires a permit for planting, trimming, pruning, or removal of dune vegetation (see Sidebar 5.20).
- **Cluster development.** Several Florida communities allow density transfers within subdivisions or PUDs that permit clustering of development and protection of sensitive environmental features. Such an approach can be effective for voluntarily protecting wetlands, floodplains, and dunes.

## Sidebar 5.19

## City of Indian Rocks Beach: 2003 Beach Management Plan

The City of Indian Rocks Beach is located on a barrier island in the Gulf of Mexico that is subject to the daily impact of wind and waves. The city's beaches are adversely affected by erosion control structures located updrift of the city and by nearby inlets.

An ad hoc committee was appointed to develop a beach management plan that deals with all issues surrounding beach management including the forces of structural, biological, environmental, and human interaction on an actively used beach within a densely populated and developed area. Recommendations of the 2003 plan concerning beach and dune systems include the following:

- Amend the City's **Comprehensive Plan** to include a policy that **erosion control structures** should be considered as an alternative of last

resort for the protection of upland infrastructure or to mitigate an emergency event, and identify "soft" engineering approaches such as beach renourishment as the preferred alternative.

- Prepare an ordinance for review and approval by the City Commission requiring that **new multi-family residential projects** fronting the beach include a **dune walkover** meeting FDEP permitting guidelines whenever the City determines that it is necessary to preclude possible erosion to the dune system.
- Prepare an ordinance for review and approval by the City Commission

requiring the **removal of exotic species and restoration of the beachfront** areas in accordance with the approved master beach landscaping plan for any residential development project that establishes a new (either additional or replacement) residential unit on a beachfront lot.

- Prepare an ordinance for review and approval by the City Commission permitting the City to **remove exotic species and restore the beachfront** area in front of an existing residential or commercial development in accordance with the approved master beach landscaping plan at the City's expense.

## Sidebar 5.20

## City of Ocean Ridge Dune Vegetation Protection Ordinance

### Section 66-161 Ocean Ridge Code of Ordinances Vegetation.

(a) Permit required for planting or removal of vegetation. It shall be unlawful for any person to plant vegetation or to remove, cover, prune or destroy the natural vegetation growing upon any dune located within the town without first having obtained a permit therefore from the administrative official...

A "no fee" permit, issued by the administrative official shall be required for the removal from the dune or dry sandy beach on a single-family residential property, by its owner or occupant, of certain invasive plant species, which are prohibited or restricted by law. A

"no fee" permit for such removal may also be granted for multifamily residential property, upon receipt of a request from the condominium, cooperative or property owners' association.

A regular town permit shall be required for removal of any plant more than six feet high, or for removal of more than 20 percent of the plants on the dune or dry sandy beach of a property within any six-month period. Unless removal is a result of a town-initiated requirement, any removal of plants on the dune or beach shall require replacement, within ten days, with beneficial plants of similar spread

or canopy, and shall be of the permitted species listed in subsection (g)(2) herein. Where removal is the result of town-initiated action, the landowner shall have up to 12 months to replace the plant material in accordance with this section.

Temporary irrigation shall be provided to replacement plants in a manner adequate to sustain at least 90 percent of such plants.

Invasive plant species, as used herein, shall include those listed in section 66-119 herein, and those listed as "invasive" in the Plant Guide II, published by the South Florida Water Management District.

- The City of Palmetto uses density transfers to protect wetlands. Developers are allowed to increase development densities on the upland portions of their sites at the rate of one unit per acre for every four acres of wetlands that remain undeveloped.
- The City of Tallahassee's Environmental Management Ordinance (see Sidebar 5.21) encourages density transfers on sites situated within areas zoned as conservation and requires

them in areas zoned as preservation. If there is no room for density transfer, development is allowed only at very low densities.

- **Incentive zoning.** This is an option for encouraging developers to donate easements that protect natural protective features such as dunes, wetlands, or natural drainage features. Development is clustered on the remaining land, but the developer is allowed to exceed the density or floor area

ratios that would otherwise apply to the zoning district.

### Setbacks and buffers

A number of local governments impose setbacks that restrict development within some specified distance of protective natural features including floodplains, wetlands, and dunes. By providing undisturbed land cover, these buffers reduce the impacts of construction and subsequent use of the adjoining land on the long-

#### Sidebar 5.21

## Density Transfers - City of Tallahassee Environmental Management Ordinance

(No. 90-O-0044AA, amended January 10, 2001)

### Section 3.1 Pre-Development Reviews.

#### (2)(a) Density Transfers and Developable Area.

1. **Conservation Areas.** In all cases, the transfer to non-environmentally sensitive areas is **preferable** [emphasis added]. Density transfer shall be within the parcel, no off-site transfer is permitted. Transfer of development density to non-environmentally sensitive areas will be allowed up to the density permitted by the existing land use category in which the parcel is located. The amount of density transfer may be limited by other applicable requirements and ordinances implemented during the development

review process such as requirements for stormwater retention, preserved urban forest and landscaping, buffer, setbacks, parking, transportation access, and any concurrency requirements. If there is no area on the site suitable for transfer, development will be allowed at one unit or 4,000 square feet of disturbance per acre unless otherwise stated. In no case shall the density be more than double the underlying density normally allowable on the developable portion of the site.

2. **Preservation Areas.** The transfer of density to non-environmentally sensitive portions of the site will be **required** [emphasis added]. Development can be transferred at the same density

allowed by the existing land use. **If there is no area suitable for density transfer, development can be allowed at one unit or 4,000 square feet of disturbance per 40 acres** [emphasis added]. In no case can the density be more than double the allowed density on the developable portion of the site. The amount of density may also be limited by other applicable requirements and ordinances such as the requirements for stormwater retention, preserved urban forest and landscaping, buffers, setbacks, parking, transportation access, and any concurrency requirements. This may result in substantially less density than the maximum density allowed by the land use category in which the parcel is located.

term integrity of the natural feature. Examples of such setbacks and buffers are presented here.

Some jurisdictions employ setbacks for the explicit purpose of mitigating the exposure of development to flooding and wave damage along rivers, lakes, and the sea. These setbacks have secondary benefits of providing buffers and reducing the need for shoreline hardening. Specific examples of development setbacks of this type are presented in Section 5.5.

- St. Lucie County's land development code (6.02.03(F)) requires **vegetated buffers around isolated freshwater wetlands** of one-half acre or more in size (see Sidebar 5.18).
- St. Lucie County also requires (LDC §6.02.02) maintenance of vegetated buffers along the county's rivers and the Indian River lagoon (see Sidebar 5.18).
- The Walton County **Comprehensive Plan** requires a 50-foot vegetative buffer adjacent to Choctawhatchee Bay, a 75-foot buffer adjacent to rivers, and 100-foot buffer adjacent to coastal lakes (Policy C-3.2.1).
- Within the major riverine floodplains of Suwannee County, the **Comprehensive Plan** requires vegetative buffers of 75 feet from perennial rivers and streams, and a 50-foot buffer adjacent to lakes, ponds, and wetlands. Furthermore, lots are required to have a length to width ratio of not more than 3:1, in order to limit the

density of lots along water bodies (Policy I.2.2).

### Purchase of property rights

As discussed in Section 5.1, fee-simple acquisition offers the greatest assurance of protection of natural features, but it is also the most costly method of doing so. Where the objective is protection of natural protective features, fee-simple acquisition is most appropriate where the land is to be used for active public recreation and/or where public use facilities are to be constructed. Fee-simple acquisition may be appropriate for protection of environmentally sensitive resources, such as coastal barriers, dunes and wetlands. Fee-simple acquisition also may be appropriate where regulatory restrictions on development of natural protective features affect so much of a property parcel that the owner has no remaining economically viable use of the property, thus potentially triggering a takings claim (see Sidebar 5.1). This may also be viewed as an "inordinate burden" and potentially trigger a claim under the state Bert Harris Act (see Sidebar 5.2). Purchase and leaseback strategies also may be suitable for such situations.

Where the objective is simply to protect the natural feature and the amount of land affected will leave the property owner with sufficient land for other uses, purchase of development rights or conservation easements can be less costly. Local governments also may secure easements as development exactions.

- **Fee-simple acquisition.** A number of local governments have acquired coastal land using local, state, and federal funds. In most cases, these purchases have served multiple purposes including the provision of active or passive recreation opportunities and services as well as preservation of natural features for their environmental and/or natural protective functions.

About one-third of the counties in Florida have passed referenda to create and fund such land purchases. Some of these funds are used to match regional, state, and federal program grants or private land conservation efforts. Several important state funding sources are described in Sidebar 5.22.

- **Palm Beach County has used funds from its Environmentally Sensitive Lands Acquisition General Obligation Bond Program to purchase environmentally significant lands within its coastal high-hazard area including the Juno Dunes Natural Area (271 acres) and the Paw-Paw Preserve (3 acres).**
- **Indian River County has acquired over 460 acres on Hutchinson Island for conservation and passive recreation with about \$7.6 million in local environmental land acquisition bond funds, coupled with about \$11.8 million in matching funds from the Florida Communities Trust, the state**

## Sidebar 5.22

### State Funding Sources for Land Acquisition

Since 1990, the State of Florida has purchased more than one million acres of environmentally-sensitive land through Preservation 2000 (P2000), the Conservation and Recreational Lands (CARL) Program, the Land Acquisition Trust Fund (LATF), and the Florida Communities Trust (FCT).

The Florida Forever Program, successor to P2000, uses documentary stamp tax revenue for the acquisition of land. Florida Forever distributes \$300 million annually to the CARL Program and the Florida Recreational Development Assistance Program administered by FDEP; the water management districts; the FCT Program at FDCA; the Fish and Wildlife Conservation Commission; the Division of Forestry at the Department of Agriculture and Consumer Services; and the Division of Recreation and Parks and Office of Greenways and Trails at FDEP.

Local governments may nominate properties for purchase by the state under the Florida Forever Program. The FDEP Division of State Lands also provides matching grants to local governments for acquisition of lands for parks, trails, and green spaces within urban areas. For more information, see <http://www.dep.state.fl.us/lands/acquisition/FloridaForever/default.htm>.

The FCT provides grants to local governments and eligible non-profit environmental organizations, for the acquisition of land for community-based parks, open spaces, and greenways that further the outdoor recreation and natural resource protection needs identified in the goals, objectives, and policies of local **Comprehensive Plans**. For more information, see <http://www.dca.state.fl.us/ffct>.

**Preservation 2000 Fund, and the U.S. Fish and Wildlife Service, with whom the county partnered for acquisitions associated with expansion of the Pelican Island National Wildlife Refuge.**

- **St. Lucie County's Land Acquisition Task Force is considering options for financing the purchase of properties within flood-prone areas that have conservation value.**

- **Purchase-and-leaseback.** The purchase-and-leaseback strategy described in Section 5.1 can be used to restrict development of property and thereby assure protection of natural protective features without potential liability under constitutional takings doctrines or Florida's Bert Harris Act where such restrictions would otherwise substantially reduce the economic value of property.

## Sidebar 5.23

### The Red Hills Conservation Program

The Red Hills Conservation Program of the Tall Timbers Research Station in Leon County, Florida, has used donated conservation easements to protect more than 70,000 acres of longleaf pine-wiregrass community that had traditionally been used as hunting plantation lands. The easement conditions serve to protect the native biological communities and the underlying Floridan aquifer while permitting landowners to retain title to their property and to continue to live on it and sell it or pass it on to their heirs knowing that it will always be protected. Easements benefit the property owner by providing substantial federal income tax deductions as well as greatly reducing or eliminating estate taxes. For more information see <http://www.ttrs.org/index.htm>.

- **Purchase of development rights and conservation easements.** There has been little direct purchase of development rights or conservation easements by local governments for the purpose of protecting natural protective features. A number of private non-profit organizations have, however, successfully used this strategy for years to protect environmentally sensitive lands (see Sidebar 5.23).

### Transfer of development rights

One of the most successful transfer of development rights (TDR) programs is that of Montgomery County, Maryland, which instituted the program in the 1980s to preserve farmland from encroaching development (see Sidebar 5.24). A number of jurisdictions have used TDR to protect environmentally sensitive areas, including the Lake Tahoe Regional Planning Agency, in California and Nevada, and Collier and Monroe counties, in Florida (see Sidebar 5.25). While none of these programs specifically targets wetlands, floodplains, or beaches and dunes, they can easily be applied to such natural protective features.

It is important to note that as a general rule, TDR is used to compensate property owners for **reduced** development density rather than a complete prohibition on development. If adequate protection of natural protective features requires an absolute ban on development, a TDR program modeled after that of the Lake Tahoe Regional Planning Agency may be more appropriate.

#### Sidebar 5.24

### Transfer of Development Rights to Protect Farmland

**Montgomery County, Maryland**, has the most successful transfer of development rights (TDR) program in the nation, with over 46,000 acres preserved as of 2000. The sending area is the 90,000-acre Rural Density Transfer Zone. Originally zoned for 1 house per 5 acres, the area was downzoned in 1980 to allow construction of just 1 house per every 25 acres. The development rights, however, can be transferred at the old density of 1 house per 5 acres, thus creating an incentive to sell development rights. Because the county's relatively affluent population has been growing fast, developers in the receiving areas have had an incentive to purchase the rights and add density to their projects.

Montgomery County established a Credit Fund to serve as a buyer of last resort, but reportedly it has never had to buy a credit. The Credit Fund also guarantees loans by private institutions to landowners who use credits as collateral, i.e., who have not yet sold them. Thus the Montgomery County

system has functioned as a passive TDR system, although it has the institutional mechanism in place to operate as an active system.

Montgomery County's TDR program demonstrates what a TDR program needs to succeed:

1. The political will to lower densities in sending areas. This provides an incentive to sell development rights in certain areas and to raise densities in receiving areas, making the purchase of development rights appealing to developers.
2. The ability of a landowner to sell enough development rights to recoup the perceived loss of value brought about by the downzoning.
3. A balance between the supply of and demand for development rights that makes their price acceptable to both buyers and sellers.

## Transfer of Development Rights to Protect Environmental Resources

### **The Lake Tahoe Regional Planning**

**Agency** instituted a TDR program based on lot coverage rather than development density that was designed to protect the water quality of Lake Tahoe. The watershed of the lake, which lies in both California and Nevada, is divided into 9 hydrologic basins or zones. Transfers take place between parcels with different environmental sensitivity ratings that are located in the same hydrologic zone. Development is prohibited on lots with very high environmental sensitivity ratings. Lots that qualify as receiving lots may increase their lot coverage up to a maximum of 30% depending on the hydrologic zone within which they are located.

California established a Land Coverage Bank, which can buy and sell coverage credits. No similar institution exists within the Nevada portion of the watershed. Data on the numbers of transfers suggest that the Land Coverage Bank may have facilitated transfers on the California side.

**Monroe County, Florida**, which includes the Florida Keys and large parts of Everglades National Park and the Big Cypress National Preserve, uses a TDR program to protect environmentally sensitive areas by retiring development rights on private vacant land. Most of the rights transferred to date

have come from the middle and lower Keys and have gone to receiving areas in the middle and upper Keys where they are used to supplement allowable densities for single-family residential subdivisions and allowable floor-areas for commercial development.

**Collier County, Florida**, established a rural land use planning program within its Rural Fringe Mixed Use District, which consists of approximately 93,600 acres, or 7% of Collier County's total land area. The primary purpose of the TDR program is to establish an equitable method of protecting and conserving the most valuable environmental lands, including large connected wetland systems and significant areas of habitat for listed species, while allowing property owners of such lands to recoup lost value and development potential through an economically viable process of transferring such rights to other more suitable lands.

Properties within the Rural Fringe Mixed Use District are designated as Sending, Receiving, or Neutral areas, based primarily upon their environmental value.

- Permitted uses within Sending areas include agriculture, sporting and recreational camps, and single-family detached residences at a density of 1 dwelling unit per 40 acres (or pre-existing parcel size

of less than 40 acres if created prior to June 22, 1999). Residential density may be transferred at the rate of 1 unit per 5 acres (or pre-existing parcel size of less than 5 acres if created prior to June 22, 1999).

- The allowed density in the Receiving areas is 1 dwelling unit per 5 acres. For parcels of 40 or more acres, the density may be increased via development credits to a maximum of 1 dwelling unit per acre. For Rural Villages, where base densities are only 0.2 unit per acre, credits must be procured to attain the minimum gross density of 2.0 units per acre.
- The permitted density in Neutral areas is 1 dwelling unit per five acres. Properties in these areas are not eligible to participate in the stewardship credit program.

Development rights also may be transferred to the Urban Residential Fringe Subdistrict on a limited basis. Within these areas, credits of one dwelling unit per acre may be transferred from Rural Fringe Mixed Use District Sending Areas to increase allowable residential densities from 1.5 to 2.5 units per acre.

### Exactions and dedications

- Pinellas County designates **wetland areas** as Preservation on the future land use map or requires developers to dedicate **conservation easements** for them; natural drainage ways, floodways, and floodplains are treated similarly.
- The City of Tallahassee Environmental Management Ordinance requires the granting of **flood zone conservation easements** on all developed property (see Sidebar 5.26).

### Education and information

Education and information programs can be a significant complement to other voluntary and regulatory strategies for protecting natural protective features. Education and information initiatives directed towards property owners and developers are important for assuring that

#### Sidebar 5.26

### Flood Zone Easements, City of Tallahassee Environmental Management Ordinance

#### **Section 3.5 Easement Requirements.**

**(2)(a) Flood Zone Easements.** All areas subject to inundation post-development during storm events, up to and including a 25-year storm, shall be protected by a conservation easement prohibiting the owner from making any alterations other than those associated with infrastructure

and vegetation management, and granting to the local governmental entity within whose boundaries a development site is located the right to periodically inundate the property. This easement shall also grant to the local governmental entity the power of enforcing the prohibition against alterations within the conservation easement.

#### Sidebar 5.27

### Homeowner's Guide to Wetlands

This FDEP handbook explains what wetlands are, why it is important to protect them, and how wetlands are regulated under federal, state, and local laws in Florida. In addition, it describes best management practices for residential construction, septic tank installation and maintenance, mangrove trimming, boat ramps, docks and piers, shoreline stabilization, and coastal construction. Copies are available online at [http://www.floridadep.org/water/wetlands/docs/erp/wetland\\_guide.pdf](http://www.floridadep.org/water/wetlands/docs/erp/wetland_guide.pdf).

## Building Back the Sand Dunes

FDEP produced this brochure to assist private property owners who want to restore sand dunes on their property. The brochure describes alternative approaches for rebuilding sand dunes as well as initiatives property owners can take to protect them. Copies are available online at <http://www.dep.state.fl.us/beaches/publications/pdf/bldgbkvw.pdf>.

they understand the applicable land development regulations. An excellent example of such an initiative is the *Homeowner's Guide to Wetlands* published by FDEP in 2002 (see Sidebar 5.27). FDEP also has produced a brochure designed to help property owners restore degraded sand dunes (see Sidebar 5.28).

### Enhance and restore natural protective features

Local government initiatives to enhance natural protective features have employed three principal strategies: (1) subdivision and site development regulations that require developers to restore degraded protective natural features, (2) capital programs to restore degraded or destroyed wetlands or beach and dune systems, and (3) capital programs for constructing and maintaining “hard” structures to mitigate flooding and coastal erosion. Capital programs are typically financed with a mix of local revenues and funds secured from the state and federal governments (see Sidebar 5.29).

### Subdivision and site development regulations

- The Town of Longboat Key's land development code (LDC §158.102(F)(5)) includes provisions that require developers to **preserve, enhance, and restore sand dunes** on properties along the Gulf of Mexico (see Sidebar 5.16).
- St. Lucie County's land development code (§6.02.01(F)) includes regulations that require the **restoration of dunes** as

## State and Federal Funding through the Florida Beach Erosion Control Program

The Florida Beach Erosion Control Program was established for the purpose of working in concert with local, state and federal governmental entities to achieve the protection, preservation, and restoration of the coastal sandy beach resources of the state. Under the program, financial assistance in an amount up to 50 percent of project costs is available to Florida's county and municipal governments, community development districts, or special taxing districts for shore protection and preservation activities located on the Gulf of Mexico, Atlantic Ocean, or Straits of Florida.

Qualifying activities 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. Eligible projects include those that have been authorized by Congress for federal financial participation and for which a nonfederal match is required. For more information, see <http://www.dep.state.fl.us/beaches/programs/bcherosn.htm>.

a condition of new development permits (see Sidebar 5.18).

- The City of Indian Rocks Beach's **2003 Beach Management Plan** recommends adoption of an exotic vegetation ordinance that requires the **removal of exotic species and the restoration of beachfront** areas by developers of new residential projects (see Sidebar 5.19).

#### Capital programs to restore degraded or destroyed natural protective features

- The Town of Longboat Key has **constructed wetlands** for use as storm water retention facilities on land acquired through **fee-simple acquisition**.
- Palm Beach County **restores and maintains dune vegetation** on privately-owned dunes where property owners are willing to **donate easements** to the county for this purpose.
- Indian Rocks Beach finances its share (25%) of a federal **beach renourishment** project within the city from its allocation of revenues from the Indian River County **tax on hotel and motel accommodations**.
- The Town of Longboat Key has established two **beach maintenance districts** within which special assessment property tax levies are used to pay off bonds that are sold to finance **beach renourishment and berm maintenance** work.
- Miami-Dade County has secured funds from the **federal Coastal Impact As-**

**sistance Program**, administered by the National Oceanic and Atmospheric Administration's Coastal Service Center, to finance dune vegetation restoration projects.

#### Capital programs for constructing and maintaining "hard" structures

In some instances, "hard" structures such as groins or jetties may be needed to prevent critical shore erosion. New seawalls are generally not permitted in Florida, but maintenance of existing seawalls may be necessary in some areas to prevent serious erosion and flood damage to adjacent upland development.

When floods affect a whole community or large parts of it, individual efforts on private property may not be adequate. Structural improvements initiated by local government may be needed, including storm water detention or retention facilities; drainage ditches, culverts, and canals; levees; and dams. Such improvements are among the most common projects included in county **Local Mitigation Strategies**. Many communities have undertaken master storm water management plans to guide expenditures for such facilities.

- The City of Jacksonville Beach is moving forward with **storm water and outfall re-engineering** to reduce the impacts of storm water flooding on homes and businesses. (This is a priority project in the Duval County **LMS**.)

#### Sidebar 5.30

### Floridatown Drainage Improvement Project

Located on Escambia Bay in the western Panhandle, rural Floridatown is one of the most flood-prone areas in the entire state. Approximately 2,000 households experience localized flooding an average of three times per year. Public health is threatened by the discharge of septic tank waste and raw sewage. Needless to say, the problems caused by hurricanes in this poorly drained area are even worse.

Using federal Hazard Mitigation Grant Program funds, the Floridatown Drainage Improvement Project was designed to alleviate inadequate drainage systems, reduce the potential for structural flooding, reduce the exposure of residents and emergency personnel to raw sewage and septic tank wastes, and improve water quality in Escambia Bay.

The project will include an analysis of the hydrology and hydraulics of the area, evaluation of existing drainage facilities, review of environmental and historic resources, and engineering, design, and construction of a new storm water drainage system. The natural drainage system will be expanded through fee-simple acquisition of private land, purchase of flood easements, and construction of new drainage channels and other facilities. The estimated cost of the project is \$4.5 million.

- Escambia County has initiated a major **drainage improvement project** in the Floridatown area on Escambia Bay using federal **Hazard Mitigation Grant Program** (HMGP) funds (see Sidebar 5.30).
- Miami-Dade County has initiated a series of **flood control projects** using **HMGP funding**, in cooperation with the South Florida Water Management District, to remedy flooding problems in several areas (see Sidebar 5.31).

## Section 5.4: Make Structures More Resistant to Natural Hazard Forces

One of the most cost-effective mitigation measures is to design and construct new buildings and retrofit existing buildings to better withstand the effects of natural disasters. Local governments to do so use three principal strategies:

- adopt and enforce building codes that govern the design and construction of private and public buildings;
- promote the voluntary use of additional protective measures in new private buildings and the retrofitting of existing structures; and
- adopt capital expenditure policies and implement capital programs to build and retrofit public facilities that are more resistant to natural hazard forces.

### Sidebar 5.31

## Miami-Dade County C-4 Basin Flood Control Project

South Florida's system of levees and water control structures were constructed in the 1950's and designed for half the population that now reside in the area. Miami-Dade County's **Local Mitigation Strategy** includes five major flood projects to mitigate floods in susceptible areas, primarily within the C-4 Basin. The cities of Sweetwater and West Miami, and the Flagami neighborhood of Miami are subject to flooding following significant periods of above average rainfall in part because the C-4 canal that drains the area is unable to convey the excess water. Other communities in the vicinity, including the Cities of Coral Gables and South Miami, and other portions of Miami, are also affected by high water levels in the C-4 Canal. Approximately 500,000 people live or work in the affected basin.

The South Florida Water Management District has proposed an extensive series of improvements that will enhance storm water conveyance through the C-4 Canal with funding provided by the Hazard Mitigation Grant Program including the following:

- Construction of a 600 cubic-feet-per-second pump station at a total cost of \$3.4 million.
- Dredging of the C-4 canal upstream to increase the canal conveyance at a total estimated cost of \$5.3 million.
- Construction of a 1-mile berm on the north C-4 canal bank in the City of Sweetwater to act as a barrier against floodwaters under high water conditions, for a total cost of \$400,000.

In addition, the City of West Miami experienced extreme flooding during an October 2000 storm. The city is modeling its storm water systems to ascertain what will be required to minimize the flooding. The city requested HMGP funds for construction of the following:

- exfiltration trenches to manage short-term rainstorms, and
- an interconnected drainage system to transport more storm water to three pump stations strategically located to discharge significant amounts of runoff into the C-4 canal.

State regulations governing the preparation of local **Comprehensive Plans** do not address building codes except in the context of the **coastal management element** that must be included in the plans of coastal communities. These communities are required to identify measures that can be used to reduce exposure to coastal flooding hazards, including structural modification, and they are directed to adopt one or more policies and regulatory or management techniques for achieving hazard mitigation, which may include regulation of building practices. **Coastal element** regulations also require local governments to inventory infrastructure within their coastal high-hazard areas (CHHAs) and to analyze the potential for relocating, mitigating or replacing threatened infrastructure in those areas.

While building codes primarily affect new construction, they also may be applied to older, nonconforming structures that were built under a previous building code. Typically, the local building code, or a separate ordinance, defines a threshold for the value of remodeling, repair, or reconstruction, above which the structure must be brought into conformance with current code standards. Under National Flood Insurance Program (NFIP) regulations, the threshold for defining “substantially damaged” and “substantially improved” is 50% of the market value of the structure. The Florida Building Code has a similar threshold – existing structures must be rebuilt in conformance with all code requirements when repairs or alterations performed

within a 12-month period exceed 50% of the value of the existing building (§§3401.7.2.6 and 3401.8.3.5 FBC). Thus, there may be cases in the aftermath of a disaster where damaged structures are required to be rebuilt to current code and, as a result, are substantially less vulnerable to future hazards.

Local government initiatives to promote voluntary use of additional protective measures, including financial assistance to private property owners for elevation of flood-prone structures, are often undertaken in post-disaster settings with federal funds available from the Hazard Mitigation Grant Program (HMGP). Similar initiatives also may be competitive for funding under the federal Pre-Disaster Mitigation (PDM) grant program authorized under the Disaster Mitigation Act of 2000. Similarly, local government initiatives to relocate or mitigate vulnerable public facilities and infrastructure often occur during post-disaster recovery and redevelopment with HMGP funds.

Specific best management practices described in this section include the following:

- ✓ enforce the Florida Building Code;
- ✓ comply with National Flood Insurance Program regulations including participation in the Community Rating System;
- ✓ adopt and enforce more stringent building code standards;
- ✓ adopt incentive zoning for inclusion of additional protective measures in new developments;

- ✓ initiate capital programs for financing shutter and elevation retrofit programs for existing private buildings;
- ✓ promote education and information programs directed at private property owners; and
- ✓ adopt capital expenditure policies and programs to build and retrofit disaster-resistant public facilities.

### Adopt and enforce building codes

As noted in Section 2.3, local governments are required to adopt and enforce the Florida Building Code, which includes standards governing the design and construction of private and public structures for resisting damage from wind-borne debris, as well as standards for elevating and/or flood-proofing habitable buildings within flood hazard areas defined pursuant to the National Flood Insurance Act. Within the areas demarcated by the state Coastal Construction Control Line (CCCL), these standards are supplemented by standards set forth in regulations adopted and enforced by the Florida Department of Environmental Protection (FDEP), Bureau of Beaches and Coastal Systems (see Sidebar 5.32). Local governments are authorized to adopt more stringent standards than those contained in either the Florida Building Code or under the CCCL permitting program. Local governments also may opt to administer the CCCL permits in lieu of the FDEP.

Three best practices are recommended:

## State Coastal Construction Control Line Standards

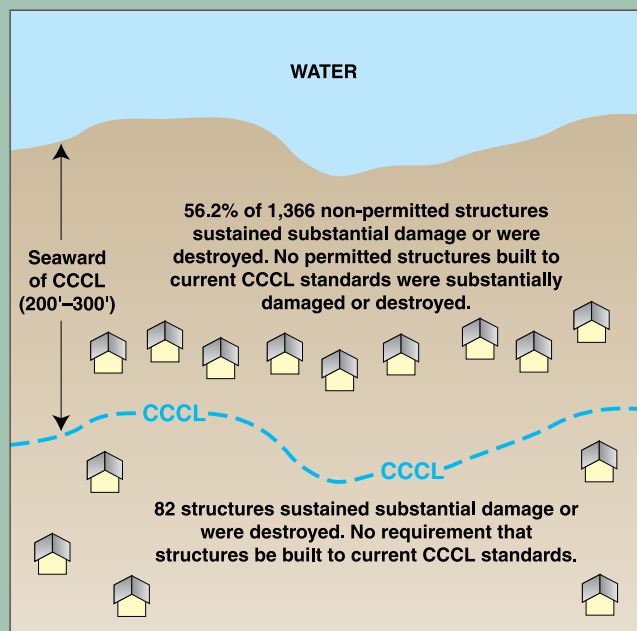
The state Coastal Construction Control Line (CCCL) permitting program protects Florida's beaches and dunes through a set of siting and design criteria that apply to habitable structures built within the CCCL zone of jurisdiction. The CCCL demarcates the portion of the beach and dune system that is likely to be eroded from a 100-year coastal storm.

The CCCL location regulations require that habitable structures be located as far landward of the CCCL as possible and sufficiently landward of the beach and dune system to permit natural shoreline fluctuations and to preserve dune stability and natural recovery following storm-induced erosion. In addition, habitable structures must be setback from the mean high water line a distance equal to 30 times the average annual erosion rate.

Specific design and construction standards must be met that are designed to resist wind, wave, and erosion conditions, and accompanying hydrostatic and hydrodynamic loads, associated with a 100-year storm event. For more information on the Coastal Construction Control Line standards, see <http://www.dep.state.fl.us/beaches/programs/ccclprog.htm>.

**Experience with Hurricane Opal:** In terms of both erosion and structural damage, Hurricane Opal, which hit Florida in 1995, was one of the most destructive storms to ever strike the coastal zone of the state. With sustained winds of 100 mph, gusts of up to 125 mph, and storm surges in excess of 20 feet, Opal's impact was most severe across the Panhandle counties, with lesser damage occurring throughout the entire Gulf coast of Florida. The majority of the structural damage within the coastal zone was due to storm surge, waves, and associated erosion. Most damage occurred within a zone extending 200 to 300 feet from the shoreline (see Figure 5.4). According to the Florida Department of Environmental Protection, none of the 576 major habitable structures

located seaward of the CCCL and permitted by the state under current standards sustained substantial damage during Hurricane Opal. By contrast, 768 of the 1,366 pre-existing non-permitted major habitable structures seaward of the CCCL (56%) were substantially damaged.



Source: URS Corporation, 2004.

- ✓ enforce the Florida Building Code;
- ✓ comply with National Flood Insurance Program regulations; and
- ✓ adopt and enforce more stringent building code standards where warranted.

### Enforce the Florida Building Code

The Florida Building Code (FBC) is based on national code models and consensus standards for the design and construction of buildings, tailored to Florida's needs. It integrates minimum plumbing, mechanical, gas, electrical, and building codes with the fire protection and life safety requirement of the Florida Fire Prevention Code. In addition, the FBC incorporates several new technical and procedural changes, some of which relate to hazard mitigation, including the following:

- Windows and glass doors are required to meet new testing standards that include water resistance, air leakage, mandatory load deflection, structural tests, and other specific installation requirements.
- Minimum requirements apply within designated wind zones (see Figure 5.5) defined by the American Society of Civil Engineers (ASCE) to ensure that buildings in high-intensity hurricane areas can withstand the impact of wind-borne debris. Buildings must either be designed to withstand pressure differentials that occur when windows and doors are pierced, or all exterior glass windows and doors

Figure 5.4: Storm surge damage from Hurricane Opal.



Source: E. Jay Baker.

- must be made of shatter-resistant glass or protected by shutters.
- All structures must comply with the requirements of the FBC.
- All manufactured buildings (*modular housing*) in Florida can only be installed if they are approved and carry the insignia or seal of approval of the State Department of Community Affairs and comply with the FBC. Mobile homes (*manufactured housing*) however, are regulated separately by the U.S. Department of Housing and Urban Development (see Sidebar 5.33).

#### Sidebar 5.33

### Regulation of Mobile Homes and Manufactured Buildings in Florida

Mobile homes. The design and construction of mobile homes, also referred to in the federal regulations as “manufactured housing,” are regulated by the federal Department of Housing and Urban Development (HUD) under Title 24, Section 3280 of the **Code of Federal Regulations**. Each mobile home must carry a permanently affixed decal that attests to its conformance to the HUD regulations. Mobile homes sold in Florida since 1994 must meet HUD wind design standards for Wind Zone II or Wind Zone III (see Figure 5.6).

Under the HUD regulations, the design wind speed for Wind Zone III is 110 miles

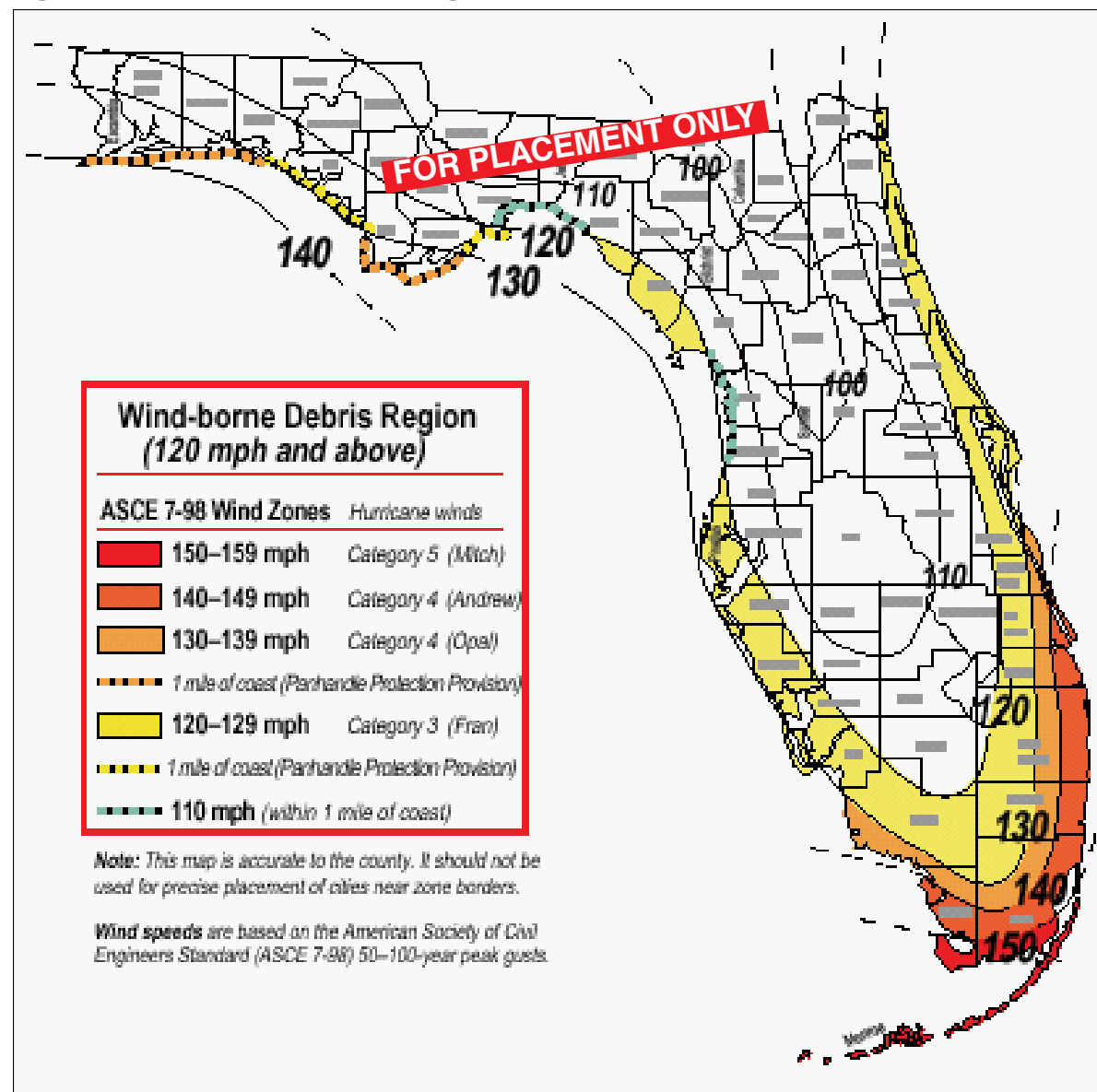
per hour (mph), fastest mile. This is equivalent to a 130 mph, 3-second gust standard, or the upper-end of the Category 3 120 -129 mph, 3-second gust ASCE 7-98 standard depicted in Figure 5.5. The fastest mile design standard for mobile homes in Wind Zone II is 100 mph. This is equivalent to a 120 mph, 3-second gust standard, which is the bottom of the ASCE 7-98 Category 3 standard.

Florida is one of the first states to adopt uniform installation requirements for mobile homes. Mobile homes in Florida must also comply with state installation standards promulgated by the State Department of Highway Safety and Motor Vehicles that specify founda-

tion design and construction and the use of tie downs and anchors to resist wind, flood, flotation, overturning, sliding, and lateral movement (§320.8325 F.S.).

Manufactured buildings. The design and construction of manufactured buildings, also known as “modular housing,” are governed by the standards of the Florida Building Code and are subject to the wind-borne debris standards that correspond to those for the wind zones shown on Figure 5.5. Such structures may be used for non-residential as well as residential purposes. In Florida, manufactured buildings must carry the insignia or seal of approval of the State Department of Community Affairs.

Figure 5.5: FBC Wind-borne debris regions of Florida.



- Flood elevation and floodproofing standards, set pursuant to the National Flood Insurance program (NFIP), must be met by all structures built within the “A” and “V” zones demarcated on NFIP Flood Insurance Rate Maps (see next section).

As well as retaining their previous roles, local governments now have the authority to:

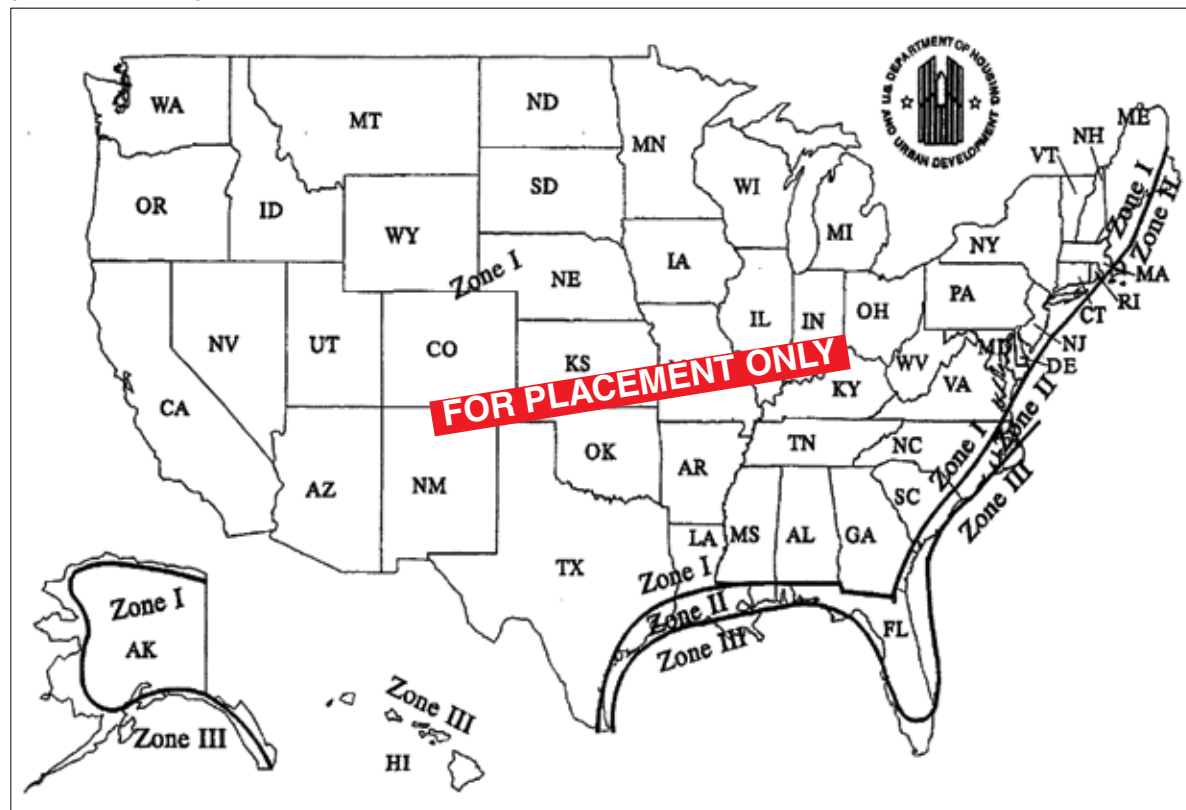
- enforce and interpret the FBC, impose fees or fines on architects, engineers, or contractors that do not comply with the building code;
- conduct plan reviews and inspections of state-owned buildings; and
- amend the code to be more stringent when local conditions justify such action.

Studies have shown that compliance with the FBC can result in substantial reductions in hurricane losses (see Sidebar 5.34). However, as with any building code, success depends on local enforcement. The Florida Department of Community Affairs (FDCA) has developed course materials and on-line training programs to help local officials effectively implement the FBC. Information about FBC training is available on the FBC website at <http://www.floridabuilding.org/tr/default.asp>.

ISO Properties Incorporated (ISO) has developed a Building Code Effectiveness Grading Schedule (BCEGS) that assesses the building codes in effect in a particular community and how the community enforces those codes, with special emphasis on mitigation of

Source: <http://www.dca.state.fl.us/fhcd/fbc/maps/2003-Wind-borne-map.pdf>.

**Figure 5.6: Housing and Urban Development wind zone map for manufactured housing (mobile homes).**



Source: 24 CFR 3280.305.

losses from natural hazards. Each community's BCEGS classification is based on three factors: (1) administration of codes, (2) review of building plans, and (3) field inspections. Communities are graded on a scale of 1 to 10, with 1 representing exemplary enforcement of a model building code or a local building

code that demonstrates equivalence to a model building code.

Private insurance premium discounts have been proposed by ISO based on the BCEGS classification system. The Florida Legislature, in legislation passed in the spring of 1995, requires insurers to either adopt the ISO discounts or develop their own discounts

tied to the ISO grading plan. Building code enforcement discounts have been required in all residential rate filings made with the Florida Department of Insurance since June 1, 1996. Figure 5.7 illustrates the distribution of BCEGS class scores for Florida communities for personal and commercial insurance lines. The personal lines classification addresses building code adoption and enforcement for single and 2-family dwellings. The commercial lines classification is for all other buildings.

### **Comply with National Flood Insurance Program Regulations**

A large proportion of Florida communities are exposed to coastal and/or inland flooding. The National Flood Insurance Program (NFIP) is a program administered by the Federal Emergency Management Agency (FEMA) that makes flood insurance available to property owners in communities that have enacted floodplain management regulations in compliance with NFIP regulations (44 CFR Section 60.3) Under the FBC, local governments in Florida are required to adopt and enforce the NFIP standards for flood hazard areas within their jurisdiction.

The NFIP standards are based on the 100-year "base flood," the flood that has a 1% probability of occurring in any given year. To provide communities with the information they need to enact and enforce floodplain management ordinances in compliance with the NFIP regulations, FEMA conducts flood hazard studies and publishes the results in the form of

### Sidebar 5.34

## Benefits of Implementing the Florida Building Code

The Florida Department of Community Affairs undertook a demonstration and education project to illustrate the costs and benefits of implementing the Florida Building Code (FBC) for single-family houses. The University of Florida and Applied Research Associates, Inc. conducted the project. The study focused on the costs of building to the new design wind speed map in both the Wind Borne Debris Regions (WBDR) and non-Wind Borne Debris Regions (non-WBDR). Using three actual houses and computer modeling for 25 other structures based on those three houses, the benefits of improved wind load design and construction were estimated by evaluating how houses built according to the FBC would perform in hurricanes compared to the same houses built to the older Standard Building Code (SBC).

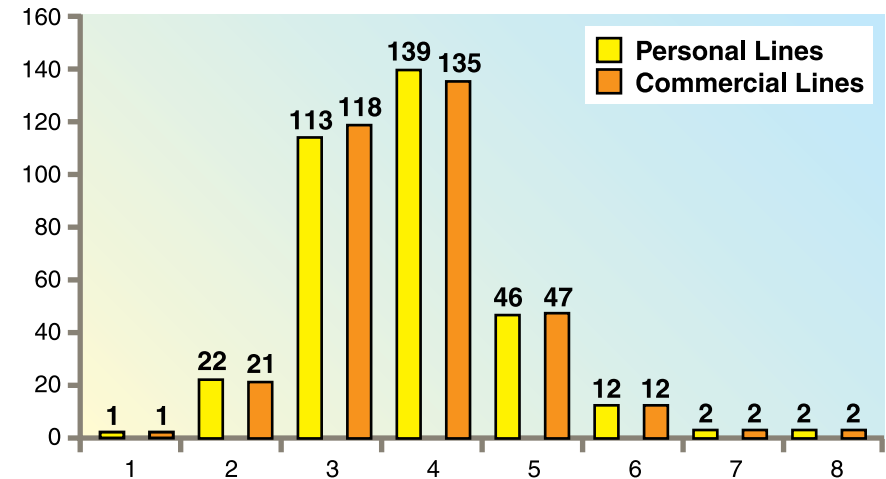
Construction in accordance with the FBC will result in stronger houses and lower losses from hurricanes,

with the “enclosed” design using impact-resistant coverings or glazing providing the greatest loss reduction. The increased costs of building to the FBC varied from \$0.77 per square foot on the low end to \$7.45 per square foot on the high end. These translate into roughly a 0.8 percent to 10.1 percent increase in selling price.

The study found that houses in the non-WBDR and WBDR will essentially break even for cost of construction versus losses avoided. However, there are clearly long-term economic benefits of reduced damage and loss for residences built to the FBC. The study showed that by adopting the FBC, losses from hurricanes will decrease by about 50 to 55% relative to a house designed to the minimum standards of the SBC, with much of the savings attributed to the roof covering. Additionally, an enclosed building design with impact resistant coverings is the design option that yields the greatest loss reduction.

Source: Florida Department of Community Affairs, *Florida Building Code Cost and Loss Reduction Benefit Comparison Study*, 2002.

Figure 5.7: Distribution of Florida communities by ISO BCEGS class.



Flood Insurance Study (FIS) reports and Flood Insurance Rate Maps (FIRMs).

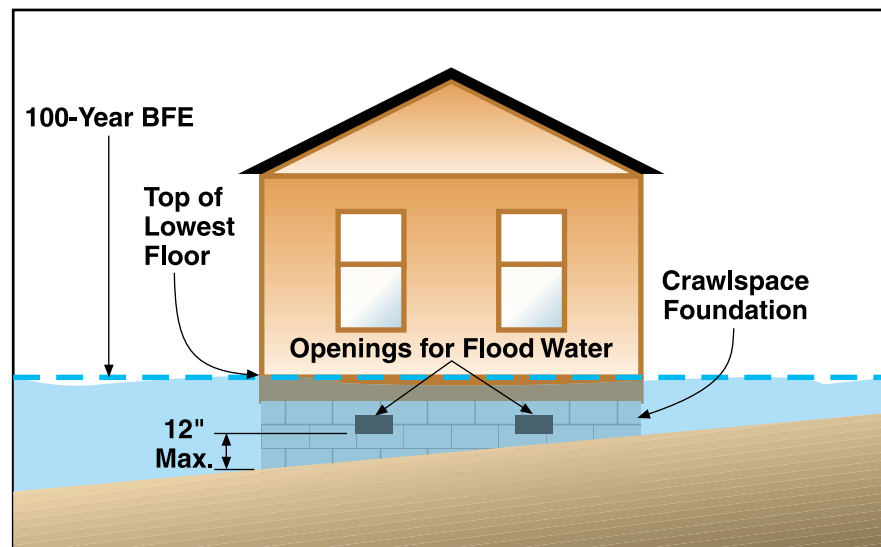
The FIRMs for coastal regions depict two types of “special flood hazard areas”:

- V-zones, which are defined as “special flood hazard areas inundated by the 100-year flood and which support a 3-foot wave or coastal floods with velocity hazards” and
- A-zones, which are defined as “special flood hazard areas inundated by 100-year floods.”

The minimum NFIP standards do not prohibit development within the regulatory

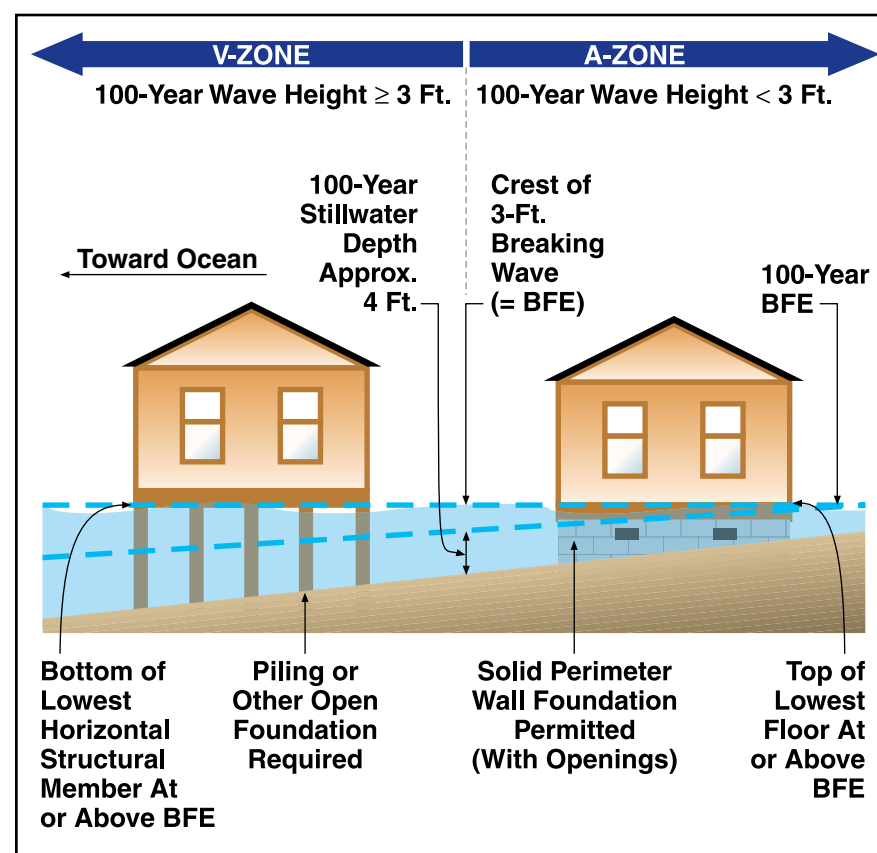
floodplain (V- and A-zones), but require the floodproofing or elevation of the first floors of buildings at or above the 100-year base flood elevations (BFEs) that are depicted on the FIRMs. The minimum standards, which apply to newly constructed, substantially damaged, and substantially improved buildings, primarily concern the type of foundation, the height of the lowest floor, the installation of building utility systems, the use of flood-resistant mate-

Figure 5.8: National Flood Insurance Program regulatory parameters.



Source: Federal Emergency Management Agency, 2000.

Figure 5.9: National Flood Insurance Program velocity and flood hazard zones.



Source: Federal Emergency Management Agency, 2000.

rials, and the use of the area below the lowest floor. The minimum requirements for V-zone buildings are more stringent than those for A-zone buildings (see Figures 5.8 and 5.9).

### **Adopt and enforce more stringent building code standards**

As noted above, Florida communities are authorized to adopt and enforce building code standards that exceed the minima contained in the FBC, and they may set requirements that exceed those of the state's CCCL permitting program within the CCCL zone. Local governments that adopt and enforce building standards that exceed the minimum in the NFIP regulations can earn points under FEMA's Community Rating System (CRS) that result in reduced flood insurance premiums for their residents and property owners (see Sidebar 5.35).

One example of a more restrictive building code standard is the recommendation in FEMA's *Coastal Construction Manual* that communities apply V-zone standards to structures built in "coastal A- zones." The NFIP regulations do not differentiate between coastal and non-coastal A-zones. FEMA's Coastal Construction Manual (see Sidebar 5.36), however, does make this distinction. Coastal A-zones are defined as the portion of the special flood hazard area landward of a V-zone or landward of an open coast without mapped V-zones, in which the principal sources of flooding are astronomical tides, storm surges, seiches, or tsunamis, rather than runoff from rainfall

#### **Sidebar 5.35**

### **National Flood Insurance Program Community Rating System**

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that contribute to meeting three goals: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. Flood insurance premium rates paid by residents of a participating community are discounted to reflect the reduced flood risk resulting from the community's actions.

Communities are classified into one of 10 classes based on 18 creditable activities, organized under four categories: (i) public information, (ii) mapping and regulations, (iii) flood damage deduction, and (iv) flood preparedness. Examples of specific creditable activities include adopting local building code standards that exceed the NFIP standards; managing development in areas not mapped on NFIP Flood Insurance Rate

maps; floodproofing or relocating existing public and private structures; helping insurance agents obtain flood data; and helping citizens obtain flood insurance.

Flood insurance premium rates in participating communities are discounted in increments of 5%; i.e., a Class 1 community receives a 45% premium discount, while a Class 9 community receives a 5% discount (a Class 10 is not participating in the CRS and receives no discount).

At present about 45% of Florida's communities are participating in the CRS program covering about 92% of the flood insurance policies in the state resulting in total annual flood insurance premium savings of more than \$78 million for their constituents.

For more information see <http://www.fema.gov/nfip/crs.shtm> and FDCA's publication, "Community Rating System: A Comprehensive Approach to Flood Mitigation."

and/or snowmelt. Because coastal A-zones may be subject to the types of hazards present in V-zones, such as wave effects, velocity flows, erosion, scour, and high winds, the FEMA manual recommends that buildings in coastal A-zones be designed to meet the regulatory requirements for V-zone buildings. These include performance requirements concerning resistance to

flotation, collapse, and lateral movement; and prescriptive requirements concerning elevation, foundation type, engineering certification of design and construction, enclosures below the base flood elevation, and use of structural fill.

Table 5.2 is excerpted from a longer table that summarizes the NFIP regulatory requirements for A, coastal A, and V-zones, and

## Sidebar 5.36

## FEMA's Coastal Construction Manual

This manual provides broad coverage of practices and techniques from planning to site layout to construction detailing in coastal areas. The materials and information in the manual have applicability throughout the planning, permitting, and construction processes and to the types of specific hazard situations found in Florida. For more information, see <http://www.fema.gov/hazards/floods/lib55.shtm>.

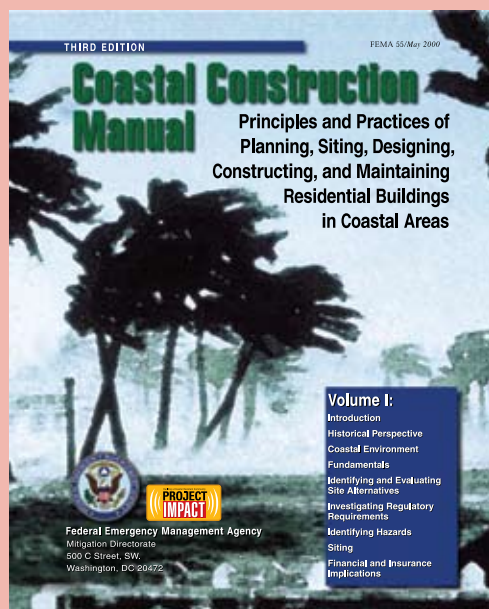


Table 5.2: Summary of National Flood Insurance Program regulatory requirements and recommendations for exceeding the requirements.

|                      |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                    |                     |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                      | V Zone                                                                                                                                                                                                                                                                                                                                                                 | Coastal A Zone                                                                                                                                                                                                                                                        | A Zone                                                                                                 |
|                      | Guidance <sup>a</sup>                                                                                                                                                                                                                                                                                                                                                  | Guidance <sup>a</sup>                                                                                                                                                                                                                                                 | Guidance <sup>a</sup>                                                                                  |
|                      |  X-ref <sup>b</sup>                                                                                                                                                                                                                                                                 |  X-ref <sup>b</sup>                                                                                                                                                                |  X-ref <sup>b</sup> |
| General Requirements |                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                        |
| Design               | <b>Requirement:</b><br>building and its foundation must be designed, constructed, and anchored to prevent flotation, collapse, and lateral movement due to <b>simultaneous wind and water loads</b>                                                                                                                                                                    | <b>Requirement:</b><br>building must be designed, constructed, and anchored to prevent flotation, collapse, and lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy<br><br><b>Recommendation:</b><br>same as V zone |                                                                                                        |
| Materials            | <b>Requirement:</b><br>structural and nonstructural building materials at or below the BFE must be flood-resistant                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                       |                                                                                                        |
| Construction         | <b>Requirement:</b><br>building must be constructed with methods and practices that minimize flood damage                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                       |                                                                                                        |
| Siting               | <b>Requirement:</b><br>all new construction shall be landward of mean high tide; alteration of sand dunes and mangrove stands that increases potential flood damage is prohibited<br><br><b>Recommendation:</b><br>site new construction landward of the long-term erosion setback and landward of the area subject to erosion during the 100-year coastal flood event |                                                                                                                                                                                                                                                                       |                                                                                                        |

Source: Federal Emergency Management Agency, *Coastal Construction Manual*, 2000.

recommendations for exceeding the requirements. For the complete table, please consult the *Coastal Construction Manual*. For more information see *A Local Official's Guide to Implementing the National Flood Insurance Program in Florida*, Florida Department of Community Affairs (2000) or see <http://www.dca.state.fl.us/brm/nfip.htm>.

Recent experience with Hurricane Charley (August 2004) has heightened awareness of the vulnerability of mobile homes to wind damage (see Figure 5.10). Preliminary assessments indicate that mobile homes constructed to the new HUD standards and meeting state installation requirements better endured the wind effects of Hurricane Charley. The Florida Department of Community Affairs recommends the following additional local policies concerning mobile homes:

- Require that mobile home units be new, *previously uninstalled* manufactured housing units that are built to HUD post-1994 construction standards and installed to post 1999 state installation requirements.

Moving and re-installation of a manufactured housing unit can compromise the structural integrity of the unit. The Federal Housing Administration, which finances manufactured housing, will not finance “moved” units.

- Require mobile home units (manufactured housing) to bear the HUD compliance decal and meet the HUD wind resistance construction standards for the appropri-

ate wind zone category for that county, i.e., Wind Zone II or III standards.

Wind Zone III standards are the highest HUD wind zone standard (see Sidebar 5.33). Manufactured homes installed in 14 of Florida's 67 counties must meet Wind Zone III standards under the HUD regulations (see Figure 5.6): Broward, Charlotte, Collier, Franklin, Gulf, Hendry, Lee, Martin, Manatee, Miami-Dade, Monroe, Palm Beach, Pinellas, and Sarasota.

- Inspect and approve the installation of all mobile homes (manufactured housing) to assure that they are installed or retrofitted to meet post-1999 state installation standards (§15C-1.0102 *F.A.C.*) and the manufacturer's installation instructions.
- At the time of the installation inspection, verify that the mobile home unit bears the required HUD compliance decal to meet the HUD wind resistance construction standards for the appropriate wind zone



Source: Florida Department of Community Affairs, Division of Emergency Management.

Figure 5.10: Mobile home wind damage from Hurricane Charley.

category for that county, i.e., Wind Zone II or III.

- In order to maintain safety during a hurricane, no attachments or add-ons shall be added to mobile home units (manufactured housing), unless that add-on follows the manufacturer's specifications for such additions and the additions meet the requirements of the FBC.

Evidence suggests that add-ons to manufactured housing such as garages and sun rooms can compromise the integrity of the unit, especially when the add-ons are directly attached to the manufactured housing structure. Likewise, some experts believe that certain types of add-on configurations can make the manufactured

housing unit more susceptible to severe wind damage.

- Designate mobile-home units constructed prior to the effective date of the 1994 HUD standards as non-conforming structures. Require that they be replaced with units meeting the current standards if they are “abandoned” as that term is defined in the local government’s land development code. Develop provisions for code enforcement that requires the removal and proper disposal of non-repairable manufactured units.

This will promote replacement of older mobile home unit with newer manufactured housing and increase public safety.

- In order to help citizens transition from older mobile home units to new manufactured housing constructed post-1994 HUD requirements and installed post-1999 state requirements, programs should be put into place to assist with the replacement of units constructed before 1994 or the retrofitting of the installation for those homes installed before 1999.

Indian River County and the Town of Indian River Shores are two examples of Florida communities that have chosen to adopt and enforce more stringent standards than those contained in the Florida Building Code.

- Indian River County requires that **first floor elevations** be constructed 6 inches above the 100-year base flood elevation.

- The *coastal management element* of the Indian River Shores *Comprehensive Plan* includes a policy that stipulates that the town shall continue to enforce local existing building code **wind design standards**, which require that all construction within the town be designed to withstand 140 mph winds.

#### Sidebar 5.37

### Nocatee Development of Regional Impact Development Order: Safe Room Requirement

Section 26(b) of the DRI development order for the Nocatee PUD located in a Category 4 evacuation zone in Duval and St. Johns counties, requires the construction of safe rooms in detached single-family residential units.

*Any single-family residential detached dwelling unit within Nocatee (in both St. Johns and Duval County) shall be constructed with a safe room. Single-family attached units such as townhouses may be constructed with a safe room or be engineered and constructed to meet a 130-mile per hour wind load. Safe rooms shall be designed by a Florida registered professional engineer generally in accordance with the design guidelines found in FEMA publication “TAKING SHELTER FROM THE STORM,” First Edition: October 1998, on file with the Northeast Florida Regional Planning Council, except as follows:*

*Live load: 150 MPH minimum.*

*Room size: 48 Square feet minimum (see FEMA publication for occupancy above 4 persons).*

*Property covenants will provide basic information about safe rooms and prohibit alterations that will negate the safe room function. Education information concerning safe rooms shall be maintained and distributed by Housing Developers and/or Community Development Districts within the Nocatee Development. All residents of this development shall be provided with information regarding the vulnerability of the development to the impacts of hurricanes. This information shall take the form of education materials designed to increase evacuation participation.*

## Safe Rooms

Safe rooms may be constructed within individual residences, in commercial buildings to protect employees, and in community shelters, both public and private, for example in mobile home parks. In hurricane-

prone areas, it may be appropriate to require them only in areas with relatively low flood hazard risk, for example, outside of 100-year flood hazard areas and landward of Category 3 storm surge or evacuation zones. FEMA has

developed a series of guidance documents and resource materials that local jurisdictions and individual property owners can use to develop safe room shelters.

### Design Considerations

**TO AVOID THIS...**



Make sure the safe room is adequately anchored to resist overturning and wind.

**TO AVOID THIS...**



The walls, ceiling, and door of the safe room must withstand wind pressure and resist penetration by windborne missiles and falling debris.

**TO AVOID THIS...**



The connections between all parts of the safe room must be strong enough to resist the wind forces without failing.

**DO THIS**



Connections to existing house walls must be designed so that damage to the house will not cause damage to the safe room.

**Possible locations in your home for a safe room include the interior room on the first floor in a basement or within a concrete foundation.**

**In a house with a slab-on-grade or crawlspace foundation:**

- ✓ Corner of the house or a free-standing, self-supporting addition to the house.
- ✓ End room, double room, or other interior room with adequate space that can be quickly accessed.
- ✓ Closet or storage room.

**In a house with a basement:**

- ✓ A free-standing addition to the basement.
- ✓ A bathroom, closet or other interior room in the basement.
- ✓ In a corner of the basement, preferably where the basement walls are below the level of the ground.

### Taking Shelter From The Storm

#### Building a SAFE ROOM Inside Your Home

The purpose of a safe room is to provide a space where you and your family can survive a tornado or hurricane with little or no injury.

There are several possible locations in your house for a safe room, but regardless of where you build it, your safe room must be able to remain standing through high winds, even if your house is severely damaged.

**Did You Know...**

Almost every state in the U.S. is subject to extreme windstorms, and the serious threat these events pose to buildings and their occupants.

Tornadoes strong enough to damage roofs, destroy mobile homes, snap or uproot large trees, and take down cars, damaging and even killing people, have occurred in virtually every state.

Major hurricanes have affected coastal areas of Florida and Gulf of Mexico coastal areas in the U.S., including Puerto Rico and the U.S. Virgin Islands.

Even states that regularly experience hurricanes are subject to extreme winds. These winds, typically near hurricane strength, include the Pacific Northwest coast.

FEMA, in cooperation with the Wind Engineering Research Center at Texas Tech University, has developed designs for wind shelters, or "safe rooms", that homeowners can build inside their houses. These shelters are designed to provide protection from the forces of extreme winds as high as 250 mph, including the impact of windborne debris.

### Do You Need a Safe Room?

**If your house was constructed within the last few years, it was probably built to code and will withstand minimum winds.**

However, extreme events such as a tornado or hurricane can often cause winds much greater than those your house was designed to withstand. And if you live in an older house, it is possible that it may not have been designed during the design and construction of the building.

If you are concerned about wind hazards where you live, FEMA has developed a worksheet booklet that provides information about conditions present over a half-year period as well as the hundred-year or historical data about hurricanes.

To determine your risk from extreme winds based on your geographic location, use the worksheet in the booklet described below. The worksheet can help you determine your risk from extreme winds based on your geographic location and whether a safe room or other shelter is appropriate for you.



**Want to Learn More?**

FEMA has prepared *Taking Shelter from the Storm: Building a Safe Room Inside Your House* for homeowners and builders. The book is available:

- ✓ Homeowner's Worksheet, Assessing Your Risk
- ✓ Design and construction techniques
- ✓ Cost estimates

*Taking Shelter from the Storm: Building a Safe Room Inside Your House* (FEMA Publication 200-1-0000) and FEMA Publication 200-1-0000 (construction plans) are available from FEMA Publications (1-800-485-6064). This booklet is also available on the FEMA website: [www.fema.gov/shelter/srbook](http://www.fema.gov/shelter/srbook).

For more information see [www.fema.gov/mit/saferoom](http://www.fema.gov/mit/saferoom).

A related example is the development order issued under Florida's Development of Regional Impact (DRI) procedures for the Nocatee PUD which requires the developer to include "safe rooms" in newly constructed detached single-family residential structures (see Sidebar 5.37). A "safe room" is a fortified space where one can safely ride out a tornado or hurricane (see Sidebar 5.38).

### Promote voluntary use of additional protective measures

In addition to enforcing building codes, local governments can take several measures to encourage the voluntary construction of additional protective measures by developers and the owners of private structures. These include:

- incentive zoning for inclusion of additional protective measures in new developments;
- capital programs for financing shutter and elevation retrofit programs for existing private buildings; and
- education and information programs directed at private property owners who are building new structures or have existing buildings.

### Incentive zoning

This is an option for encouraging developers to go beyond building code and land development code requirements in the design and construction of new developments and redevelopment projects. The City of Palo Alto, Cali-

fornia, permits a 25 percent increase in floor area ratio, or an additional 2,500 square feet of floor area, for redevelopment projects that voluntarily upgrade buildings to higher seismic safety standards. Incentive zoning offers an alternative to mandating the construction of safe rooms in new construction and redevelopment projects.

### Capital programs for retrofitting private structures

Vulnerable structures in areas exposed to coastal storms and flooding can frequently be modified to further protect them from wind and flooding. The most commonly used retrofit measures include floodproofing, elevation, and wind-retrofitting. For more information, see FDCA's publication, "Retrofitting and Flood Mitigation in Florida" (Sidebar 5.39).

- ✓ **Floodproofing.** Two principal floodproofing measures have been used in Florida:
1. wet floodproofing, which allows flood waters to enter portions of a building that can resist flood waters and that are not used as habitable areas (e.g., garages, crawl spaces) or that do not contain equipment and materials that would be significantly damaged; and
  2. dry floodproofing, which completely seals the exterior of a building to prevent the entry of flood waters.

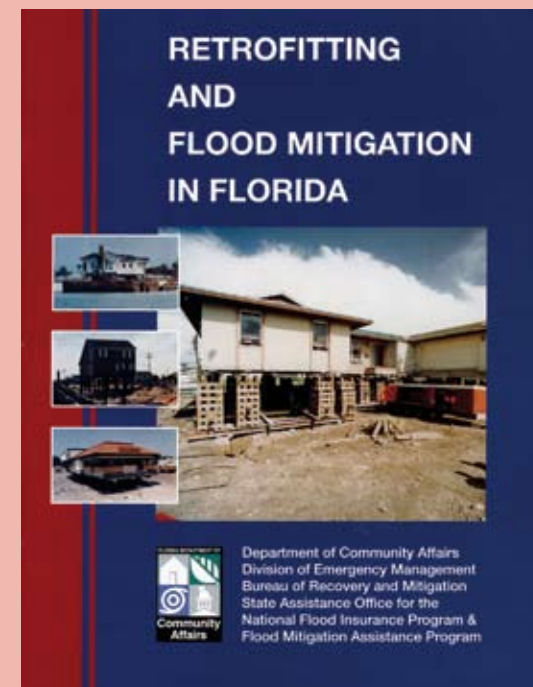
Wet floodproofing is usually used for basements and garages. Dry floodproofing is appropriate for buildings on sound slab founda-

#### Sidebar 5.39

### Retrofitting and Flood Mitigation in Florida

This guide discusses flood mitigation and describes several retrofitting measures that can be applied to existing structures to make them less vulnerable to flooding. This guide is especially applicable to those structures that have sustained or are vulnerable to repetitive flood damage.

Source: Florida Department of Community Affairs, 2002.



tions that are subject to no more than 3 feet of flooding. Most walls and floors are not strong enough to withstand the hydrostatic pressure from more than 3 feet of water.

- ✓ **Elevation.** Another retrofit measure that is increasingly being used in Florida and other floodprone states is to elevate floodprone structures so that the living or working area is above the 100-year base flood elevation.

The most appropriate elevation method depends on the location of the structure. Elevation on fill may be permitted in areas exposed to low-velocity flooding, but may not be allowed in A-zones and

is prohibited in V-zones under the NFIP regulations. Elevation on extended foundation walls is commonly used in areas exposed to low and moderate flood depths and velocities. Elevation on columns or piles (see Figure 5.11) is recommended for greater flood depths. Use of piles is required in FEMA V-zones and within the state's CCCL regulatory zone.

- ✓ **Wind-retrofitting.** Hurricane shutters, hurricane clips, tie downs, doorway reinforcements, and other wind-retrofit measures have been widely used, particularly in South Florida, to protect hospitals, schools, police and fire stations, emer-

gency operations centers, and other critical facilities, as well as private residences, that are at risk from hurricane-force winds. Wind-retrofit measures, notably shutters, are also an integral feature of the FDCA Division of Emergency Management's public shelter deficit elimination strategy.

The principal funding vehicle that has been used to finance retrofit projects initiated by local governments in Florida, including elevation proj-

ects for private structures and shutter retrofits for privately-owned critical facilities, has been the federal Hazard Mitigation Grant Program (see Sidebar 5.10). A number of counties that have included such projects in their *LMSs* report are waiting for the availability of HMGP funds to carry out those projects.

- ✓ Pasco County used HMGP funds to help finance the **elevation** of one **repetitive loss structure** that was **built prior to the NFIP** (see Sidebar 5.40). The County used funds from the Flood Mitigation Assistance Program (FMAP) to help finance

Figure 5.11: Elevation on piles in the V-zone.



Source: Federal Emergency Management Agency, 1999.

#### Sidebar 5.40

### Pasco County Residential Property Elevation

El Niño rainfall in 1998 caused severe flooding along the Anclote River. Several roads and several homes along Elfers Parkway were flooded. One resident, who experienced substantial flooding, elected to accept a county offer to help finance elevation of his home with HMGP funds. The resident received \$59,250 from the grant program to accomplish the elevation. Pasco County did not provide matching funds, but did offer guidance and grant administration for the resident. The resident agreed to provide a match of \$19,750. With the elevation project 80% complete, the homeowner avoided flood damage from spring floods that occurred in 2003.

## Sidebar 5.41

## Federal Flood Mitigation Assistance Program

The Flood Mitigation Assistance Program (FMAP) was authorized in 1994 for the purpose of funding the acquisition or elevation of repetitively damaged structures that are insured under the National Flood Insurance Program (NFIP). FMAP provides up to 75 percent of eligible costs of projects that meet the eligibility criteria. At least 25 percent of the total eligible costs must be provided by a non-Federal source. In addition to Community Development Block Grant and local or state funds, the match may include property owner funds or a portion of flood insurance claim payments. No more than 12.5 percent may be from in-kind contributions.

the elevation of several other private repetitive loss structures (see Sidebar 5.41). For guidance on both floodplain elevation and acquisition projects, see FDCA's *Handbook for Floodplain Acquisition and Elevation Projects* (see Sidebar 5.42).

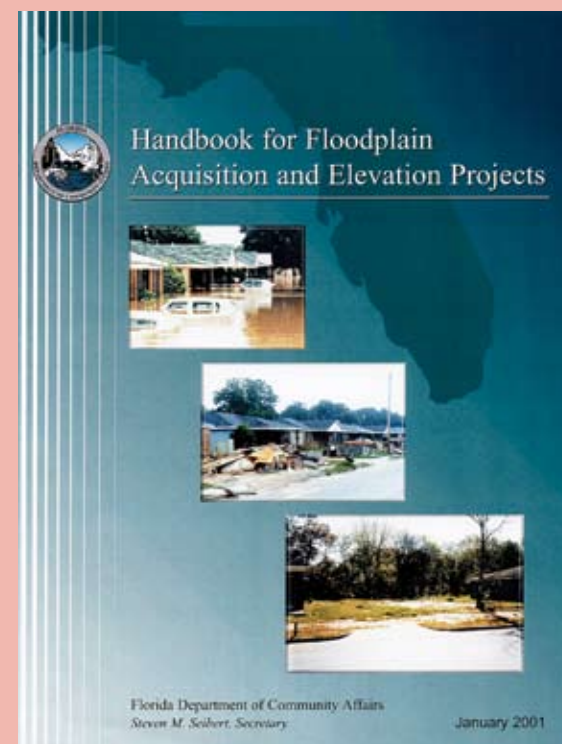
- ✓ Miami-Dade County procured HMGP funds to retrofit three hospitals with storm shutters after Hurricane Andrew in 1992 (see Sidebar 5.43).

## Sidebar 5.42

## Handbook for Floodplain Acquisition and Elevation Projects

This handbook addresses the acquisition, demolition, relocation, and elevation of private residential structures that have suffered repetitive flood damage. It includes information on funding available under the federal Hazard Mitigation Grant Program and the federal Flood Mitigation Assistance Program. The handbook is organized to follow the entire process, from planning a project, deciding policies, preparing the application, and implementing the project, to closing out the books.

Source: Florida Department of Community Affairs, 2001.



### Public education and information

Several communities have initiated education and information programs to promote the adoption of voluntary mitigation measures by private property owners.

- Hillsborough County has operated a **hazard mitigation inspection program** conducted by county building inspectors

and energy audit inspectors. Bulk mailings have been used to inform property owners of the service. The inspections are provided on request when the county has funding available for the program. The project has been funded with grants from Fannie Mae, the Federal Alliance for Safe Homes (FLASH), and the Florida Home Builders Association.

## Mitigation Success Stories: Wind Shutter Protection

After Hurricane Andrew in 1992, damage surveys showed that not only did wind and rain penetration cause substantial damage, but in many instances the wind was able to get inside buildings, damaging contents and creating direct wind pressures that placed stress on the interior walls and roofing systems. The result was partial or complete blowouts of major structural systems such as walls and roofs.

One of the principal recommendations of the ***Building Performance: Hurricane Andrew in Florida*** report prepared by FEMA (1992) was the use of shutters in new buildings and the retrofitting of existing buildings with wind-resistant shutters, particularly critical facilities such as hospitals and other buildings that provide emergency services.

The following case study shows how wind shutters, which are a relatively low-tech retrofit, can save important public facilities from major damage and disruption.

### Protecting Miami's Hospitals with Wind Shutters

The damage from wind, wind-driven debris, and rainwater penetration during Hurricane Andrew caused \$10 million in damage to three Miami hospitals. In addition, interruption of services cost another \$4.8 million. In all three hospitals, windows and doors were blown out. The breaching of the building envelopes allowed rain and wind inside, causing damage to the interiors and contents of the buildings.

With HMGP funds secured by Miami-Dade County, the three hospitals, and approximately 160 other critical facilities and public buildings, have been retrofitted with wind shutters. The most common types are roll-down and accordion shutters. They share the same function: to protect building envelopes and all exterior openings (doors, windows, skylights, and ventilation louvers).

A total of 753 openings were retrofitted with wind shutters in the South Miami Hospital. During Hurricane Georges, it took hospital staff 6 hours to fully shutter the facility, compared to the three days it took to put up plywood prior to Hurricane Andrew.

## University of North Florida Small Business Development Center

This case study demonstrates that mitigation measures with a relatively low cost per structure can add up to substantial property protection. UNF's Small Business Development Center (SBDC) established a Small Business Mitigation Rebate Program with a \$25,000 Project Impact seed grant. The SBDC provided free mitigation assessments and a \$1,000 rebate for mitigation projects for 26 local small businesses. The first business to complete a mitigation project was Uli's Restaurant on 216 11th Avenue South in Jacksonville Beach. Uli's installed hurricane shutters and was featured in The Beaches Leader newspaper.

## Miami-Dade County Education and Economic Incentive Programs

- The county worked with Home Depot and the Federal Alliance for Safe Homes (FLASH) to put on expositions demonstrating how simple do-it-yourself projects, such as building boxes to elevate air conditioning systems and hot water heaters, can reduce homeowner vulnerability to hurricanes and flooding.
- The county also prepared a brochure entitled "Mitigation for Misers," that describes mitigation projects that homeowners can undertake for less than \$100.

- The University of North Florida Small Business Development Center used funds from FEMA's Project Impact (no longer in existence) to finance a combined project of **technical and financial assistance to small businesses** in Duval County (see Sidebar 5.44).
- Miami-Dade County has undertaken a number of **education and information programs targeted at residential hazard mitigation** (see Sidebar 5.45).

### Capital expenditure policies and programs to build and retrofit disaster-resistant public facilities

Local governments should be just as concerned with the disaster-resistance of their own buildings and facilities as they are with private buildings, and the standards used for constructing public buildings should be just as rigorous, if not more so. Explicit capital expenditure policies to design and build more disaster resistant public facilities and infrastructure may be appropriate for inclusion in the **capital improvements element** of a community's *Comprehensive Plan*.

The pace of recovery following a disaster is directly influenced by how quickly a community's basic services—electric power, water supply, wastewater treatment, telecommunications, gas, transportation—are back online. Community infrastructure should be designed to withstand the effects of flooding, storm surge, waves, and high winds as well as

manmade and technological hazards. FDCA has prepared a handbook that provides information about such initiatives (see Sidebar 5.46).

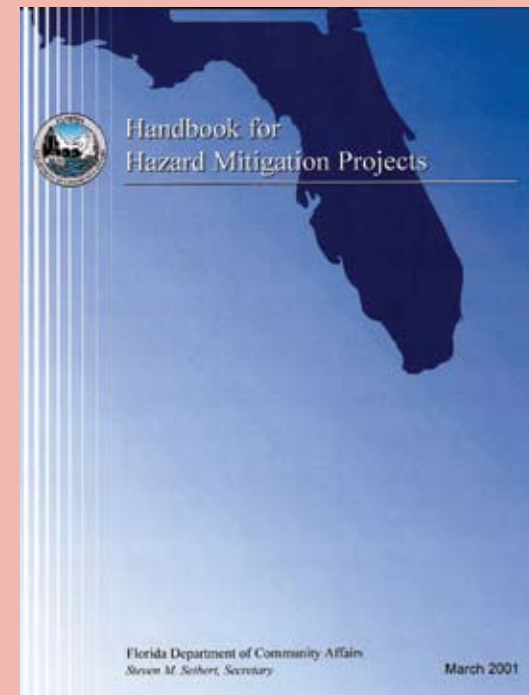
- Miami-Dade County has adopted **storm-resistant vegetation landscape standards** that are included in contracts **for all new public facilities**.
- A fire district in Manatee County **constructed a new fire station** on higher ground to replace an existing facility that had been subject to repetitive flood damage.
- Sarasota County recently adopted a downtown redevelopment plan that includes **construction of a new city hall**. The existing structure does not meet current building standards and is located in a Category 2 storm surge zone. The proposed new site, two blocks away, is on higher ground, outside the Category 2 zone.
- Pasco County used HMGP funds to finance **drainage improvement projects** to reduce flooding of several county roads (see Sidebar 5.47).
- The consolidated City of Jacksonville's municipal utility company, JEA, has undertaken initiatives to reduce the vulnerability of its **power lines** and **service centers** to hurricane wind damage (see Sidebar 5.48).

#### Sidebar 5.46

### Handbook for Hazard Mitigation Projects

This FDCA handbook details the planning process for securing federal funds under the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program for mitigation projects that protect existing public buildings and critical facilities, including floodproofing, elevation, relocation and wind retrofitting of existing public buildings, floodproofing of sewer lift stations, and drainage improvements.

Source: Florida Department of Community Affairs, 2001.



#### Sidebar 5.47

### Highway Flooding Mitigation in Pasco County

Pasco County experienced widespread flooding of roadways and homes during the 1998 El Niño event. Hazard Mitigation Grant Program funds enabled the county to make improvements that successfully prevented flooding during a subsequent flood event in spring 2003. The county spent \$549,857 in HMGP funds to improve the drainage of five roads that were impassable during the El Niño event. During the 2003 spring rains, four of these roadways did not flood. The fifth one did flood but was still passable; the previous floodwater depth of 12 inches was reduced to 6 inches.

#### Sidebar 5.48

### City of Jacksonville/Duval County – Electrical Utility Continuity of Operations

Jacksonville Electric Authority (JEA), the municipal electrical, water, and sewer utility in Jacksonville-Duval County, has committed to placing at least 20 miles of electrical distribution lines underground each year. Over their 7-year plan, this will “harden” at least 140 miles of electrical distribution lines. JEA has also utilized \$20,000 in Hazard Mitigation Grant Program funds to shutter its service centers for hurricane wind and debris impact resistance.

#### Sidebar 5.49

### Public Facility Storm Shutter Projects

Hurricane Andrew broke windows on all sides of the four buildings that make up the Metro-Dade County Office of Community Services. Damage totaled almost \$150,000. Afterward the center installed removable galvanized steel storm panels and aluminum accordion shutters, at a cost of just \$30,000 in HMGP funds. A benefit-cost analysis, based on projected future damages similar to those sustained during Hurricane Andrew, determined that every \$1

invested in wind shutters at the center would result in a savings of at least \$5 in mitigated interior damages should a future event occur.

**Shuttering the Panama City Municipal Building.** Located on St. Andrew Bay in the Florida Panhandle, Panama City has experienced one hurricane of Category 3 strength or greater every 20 years. In 1995, Hurricane Opal struck the city with sustained winds of 115 mph. The city suffered extensive flooding, erosion, and wind damage.

State and local officials recommended a wind retrofit project for the Panama City Municipal Building, using HMGP funds. The project called for the installation of 63 aluminum shutters designed to withstand winds of up to 120 mph, and 69 electrical circuits and switches to operate the shutters. The total cost was \$120,920. The building can now be shuttered in minutes, a procedure that is tested weekly.

- Miami-Dade County and Panama City have completed **storm shutter projects** that have substantially reduced the vulnerability of public buildings to hurricane wind damage (see Sidebar 5.49).

## Section 5.5: Manage Development and Redevelopment

Use of land use planning and development management tools to manage the development and redevelopment of land is one of the most effective strategies for reducing community vulnerability to coastal storms and associated flooding. As noted in Section 2.5, there are a number of directives in the state's regulations governing the preparation of local **Comprehensive Plans** that require local governments to assess the potential to use these tools for hazard mitigation purposes.

- All local governments are required to include an analysis of proposed development and redevelopment of flood prone areas in the future land use elements and policies that regulate areas subject to seasonal or periodic flooding.
- All local governments also must include a policy in the **capital improvements element** that identifies the elimination of public hazards as a criterion for evaluating capital improvement projects.
- Coastal communities are required to identify measures in the **coastal management**

**element** that can be used to reduce exposure to coastal flooding hazards, including relocation and public acquisition.

- Coastal communities also must include an objective in their **coastal element** that directs population concentrations away from coastal high-hazard areas (CHHAs), and they must adopt policies that limit development within CHHAs and regulate land use so as to reduce the exposure of people and property to natural hazards.
- Coastal communities are required to include objectives in their **coastal element** and their **capital improvements element** that limit public expenditures for infrastructure and public facilities that subsidize development in CHHAs.

Nearly all of the land use planning and development management tools listed in Table 5.1 can be employed to manage development and redevelopment in areas exposed to coastal storms and associated flooding, including the following:

- zoning regulations;
- overlay districts;
- setbacks and buffers;
- subdivision and PUD regulations and cluster development;
- site design regulations and performance standards;
- incentive zoning;
- fee-simple property acquisition;
- purchase-and-sellback or leaseback;

- purchase of development rights;
- transfer of development rights;
- capital expenditure policies; and
- education and information.

Examples of the applications of these tools for these purposes are presented in the following sections. Pre-disaster applications include decisions about allowable land uses on vacant land and the provision of public facilities and infrastructure to serve those uses as well as decisions about redevelopment initiatives in areas that are “built out”. Some of these tools also may be useful in post-disaster recovery settings where opportunities may arise for redevelopment initiatives that reduce community vulnerability to future hazard events. Unless otherwise noted, the applications described pertain to pre-disaster settings.

### Zoning regulations

Zoning regulations are employed to achieve two principal hazard mitigation policy objectives within CHHAs and other flood hazard areas:

- restrict certain land uses that are especially vulnerable, and
- restrict land use intensities within hazard zones so as to minimize the amount of property and the number of people who are vulnerable.

Both of these applications may contribute to maintaining or reducing hurricane evacuation clearance times and emergency shelter

demands (see Section 5.2) as well as the public safety objective of reducing vulnerability.

### Restrict vulnerable uses

- Several coastal communities restrict or prohibit “**special needs**” facilities within their CHHAs (typically defined as the Category 1 evacuation zone). These include such land uses as adult congregate living facilities, hospitals, nursing homes, homes for the aged, and total care facilities that are likely to require extraordinary efforts to evacuate in the event of a tropical storm or hurricane.

Some jurisdictions also “discourage” such facilities in Category 2 evacuation zones for example, by requiring special condition permits.

Escambia County prohibits such special needs facilities unless developers submit an evacuation and sheltering plan for residents.

- Manatee County prohibits new **manufactured homes** within its CHHA. Escambia County requires issuance of a “special condition” permit for mobile homes within its CHHA. As indicated in Sidebar 5.49, community restrictions of mobile homes may be constrained by state laws intended to avert discrimination against such housing. This may be particularly challenging

### Sidebar 5.49

## State Law Regarding Restriction of Mobile Homes

It may be desirable to restrict mobile homes from areas subject to hurricane force winds that exceed the design and construction standards set by the federal Department of Housing and Urban Development (HUD) (see Sidebar 5.33) because the highest HUD standard (130 mph, 3-second gust) is not equivalent to those applied under the Florida Building Code for site-built housing in the ASCE 7-98 wind-borne debris zones for Category 4 and 5 hurricanes (130-139; 140-149; and 150-159 mph 3-second gust). (see Figures 5.5 and 5.6).

State regulations governing the Housing Element of local Comprehensive Plans state that local governments need to address the provision of “adequate sites” for mobile homes (§§9J-5.010(3)(b)(3), **F.A.C.**). Where a jurisdiction lies entirely within one of the ASCE 7-98 Category 4 or 5 wind-borne debris zones, this rule may be problematic.

State law does not prohibit zoning and land use regulation of mobile homes. It requires that “[s]uch local requirements and regulations and others for manufactured homes must be reasonable, uniformly applied, and enforced without distinctions as to whether such housing is manufactured, located in a mobile home park or a mobile home

subdivision, or built in a conventional manner” (§320.8285(6) F.S.). However, local governments may not “prohibit siting or resiting of used mobile homes based solely on the date the unit was manufactured.”

For example, in 2003, Jacksonville amended its land development regulations by adopting an aesthetic ordinance. This ordinance allowed any type of housing, i.e., HUD approved manufactured housing, as well as any housing type built to the Florida Building Code, to be located in the residential zone of the city provided that it meets the criteria set forth in the aesthetic ordinance. In this way there are no restrictions on the location of manufactured housing placement, but rather on the appearance of the type of housing located within the city.

It may be possible within the spirit of these statutory provisions to restrict any type of new residential structure within a community that does not meet the ASCE 7-98 standard that applies to a jurisdiction. Such a rule may, however, be constrained by state and federal law, which precludes state and local governments from imposing more stringent design and construction standards for manufactured housing than those promulgated by the federal government.

for jurisdictions that lie entirely within the CHHA.

### Restrict land use intensity

Several coastal communities have restricted residential densities within their CHHAs. Down-zonings, however, raise the potential for claims under Florida's Bert Harris Act (see Sidebar 5.2 in Section 5.1).

- The City of Palmetto requires either that **residential densities** be **limited** to 4 dwelling units per acre (du/ac) within its CHHA or that developers submit a PUD, which clusters development in areas outside the CHHA.
- Vero Beach limits **residential densities** to 15 du/ac on its barrier island.
- Indian River County **zoned** 8,000 acres within a **floodplain as agricultural land** (AG-1) thereby limiting the maximum allowable residential density to 1 dwelling unit per 5 acres.
- The Town of Longboat Key **down-zoned** all **property within** its **V-zone** in 1984, thereby rendering most multi-family and hotel and motel land uses as non-conforming. Lower intensity uses have replaced these high-occupancy facilities as properties have been redeveloped. If one of these non-conforming structures were substantially damaged in a coastal storm, they also would be required to be redeveloped in conformance with the new zoning. (Note: rezonings prior to May 11,

1995, are not subject to the provisions of the Bert Harris Act.)

- Okaloosa County **down-zoned portions of its CHHA** its 2000 EAR-based *Comprehensive Plan* amendments from maximum allowable residential densities of 16 and 25 units per acre to 5 units per acre. The changes were initiated based on damage experienced in 1995 from Hurricane Opal and a subsequent FEMA Flood Insurance Restudy that resulted in reclassifying a number of coastal areas from X-zone to A-zone designations and others from A-zone and X-zone designations to V-zones.

### Overlay districts

Several examples of overlay districts used to protect dunes are described in Section 5.3. Land development regulations that apply zoning and site development regulations within specified hazard areas such as the CHHA, V-zone, or 100-year floodplain, or within spatially defined regulatory zones such as the state's Coastal Construction Control Line (CCCL) (see Sidebar 5.32 in Section 5.4) use this same approach.

- Walton County's *coastal management element* defines a **Coastal Protection Overlay Zone**, which includes all of the Category 1 storm surge area and much of the Category 1 evacuation zone. Within that overlay zone, **new lots are prohibited**

**that do not have buildable areas landward of the CCCL.**

### Setbacks and buffers

As described in Section 5.4, Florida's CCCL permitting program requires habitable structures built within the CCCL regulatory area to be setback from the mean high water line a distance equal to 30 times the average annual erosion rate. While this provision is intended primarily to protect the beach and dune system from damage, it also reduces the vulnerability of these structures to storm surge flooding and wave damage. A number of coastal communities require additional setbacks along the open coast.

- The Town of Longboat Key restricts most structural improvements within a "**gulf waterfront yard**" that may extend further landward than the CCCL (see Sidebar 5.50).
- The City of Venice has a similar provision in which development is prohibited within a "**shoreline hazard area**" defined by a 150-foot **gulf-front setback**.
- The City of Fort Myers Beach requires all buildings to be **relocated landward of the 1978 CCCL when rebuilt**, a provision that is triggered when structures are substantially damaged in a disaster.

## Town of Longboat Key Land Development Code: Gulf Waterfront Yards

### §58.150(D) **Required Waterfront Yard Requirements**

(1) *Required gulf waterfront yard. Every lot which abuts the Gulf of Mexico or an established erosion control line shall have, on the gulfside, a required gulf waterfront yard. The required gulf waterfront yard shall be a minimum of 150 feet in depth. The seaward edge of the yard from which the depth shall be measured shall be the mean high water-line; except that, where an erosion control line has been established, the depth shall be measured from that line.*

(a) *Where the state coastal construction control line for Manatee County and the original proposed state coastal construction setback line for Sarasota County... lies more than 150 feet upland from the mean high-water line or erosion control line, the state coastal construction setback line shall be the landward edge of the required gulf waterfront yard. In no event, however, shall the required gulf waterfront yard be less than a minimum of 150 feet in depth, except as for provided in subsection (b) below.*

(b) *No structures, buildings, swimming pools... drives, vehicular parking, walls and fences may be built within the required gulf-side waterfront yard except for beach shelters, pool fences and windfalls,... and dune walkover structures, sand fences, accessory decks or marine structures...*

## Subdivision and PUD regulations and cluster development

As noted in Section 5.1, one of the features of the subdivision and PUD review processes is the opportunity for local officials to review and negotiate the details of larger scale, and in the case of many PUDs, multi-use developments. Cluster development often is a condition set for approval of subdivision plats and PUD proposals.

- Escambia County requires a **PUD review and approval process** for development projects with densities greater than 20 units per acre on a coastal barrier island. This process entails reporting and review of formal findings of fact concerning the effect of the proposed development on coastal population densities, health and safety of the general public, and evacuation times.
- The City of Palmetto requires either that residential densities be limited to 4 dwelling units per acre (du/ac) within its CHHA or that developers submit a **PUD**, which **clusters development** in areas outside the CHHA.

## Site design regulations and performance standards

Two categories of site design regulations and standards can be important to reducing vulnerability to coastal storms and associated

flooding: (1) storm water management, and (2) landscape design.

## Storm water site design best management practices

Storm water management regulatory authority in Florida is shared between the State Department of Environmental Protection (FDEP), four of the five water management districts, and local governments. Local governments are responsible for adopting a **Comprehensive Plan** that is consistent with state and regional storm water management goals, and for implementing a storm water management program that includes the development and implementation of a storm water master plan and provisions to assure that storm water systems are properly operated and maintained.

Most development projects receive a storm water management permit from regional water management district (WMD) that includes performance standards to minimize flooding by limiting post-development storm water peak discharge rate and, in some cases such as closed basins, storm water volume. In the Florida Panhandle, these permits are issued by FDEP, rather than the Northwest Florida Water Management District. The permits prepared by the WMD or FDEP are reviewed and approved by local governments to assure consistency with their local **Comprehensive Plans** and land development regulations. At this time, nonstructural, land use planning best management practices (BMPs) are incorporated into a project. For more information concerning the

coordinated storm water management regulatory program in Florida see <http://www.dep.state.fl.us/water/nonpoint/urban1.htm>.

Florida's growth management and urban storm water management programs rely on both structural and nonstructural BMPs for minimizing flooding and nonpoint source pollution. Technology-based **structural BMPs** are required on all new developments and redevelopments to help mitigate the increased stormwater peak discharge rate, volume, and pollutant loading that accompany urbanization. The most widely used structural BMPs include retention or infiltration areas, wet detention ponds, constructed wetlands, sand filters, bioretention areas, vegetated buffer strips along streams, and swales.

**Nonstructural BMPs**, also called "source controls," are used to minimize the amount of storm water runoff that leaves a site through such measures as preservation of wetlands and floodplains (see Section 5.3) and minimizing impervious surfaces through site design and construction measures. For examples of specific site design and performance standards that can be employed through local land development regulations, see FDCA's Protecting Florida's Springs: Land Use Planning Strategies and Best Management Practices (available online at <http://www.dca.state.fl.us/fdcp/publications/index.htm>). For more information about non-structural and structural BMPs see FDEP's Florida Development Manual: A Guide to Sound Land and Water Management (avail-

able online at <http://www.dep.state.fl.us/water/nonpoint/pubs.htm>).

Orange County, Florida, includes **storm water performance standards** within its subdivision regulations that leave developers free to use whatever combination of structural and non-structural BMPs is most cost effective. New developments must retain the first one-half inch of runoff, or the runoff resulting from the first one inch of rainfall, whichever is greater. In addition, the post-development peak rate of storm water discharge must not exceed the pre-development peak rate of discharge from the site for a specified storm event.

### Landscape design best management practices

The choice of landscape vegetation can have a dramatic effect on the amount of debris generated from a residential or commercial site that is exposed to the high winds of a tropical storm or hurricane. This debris can clog storm water drains and result in local flooding. It also may become wind-borne debris that can inflict damage on other private and public property.

Miami-Dade County has developed a **landscape manual** that identifies trees that can best withstand flooding, drought, and wind. The county also has developed an ordinance that **prohibits the planting of trees** that do not meet these standards.

### Incentive zoning

As discussed in section 5.1, incentive zoning is an option for **encouraging developers to cluster development** within portions of a

subdivision or PUD that are outside of flood hazard zones. In return, the developer is allowed to exceed the total density or floor area ratios that would otherwise apply to the zoning district.

### Fee-simple property acquisition

As described in the following subsections, Florida communities have used fee-simple property acquisition to **reduce the amount of developed land that is vulnerable to coastal storms and associated flooding** in both pre-disaster and post-disaster contexts.

### Pre-disaster applications

In a number of communities, property has been purchased in coastal areas for multiple purposes that include **protection of natural resources and/or provision of open space and active or passive recreation opportunities** while at the same time **excluding hazardous areas from development**. In addition to serving a hazard mitigation function, such acquisition may help to preserve the natural protective functions of floodplains, wetlands, beaches and dunes (see Section 5.3). These purchases are typically pre-disaster acquisitions accomplished with a variety of funding sources.

- The City of Layton, located in the Florida Keys, purchased two **vacant commercial parcels** on U.S. Route 1 with local funds for use **as green space**.
- Palm Beach County has used funds from its **Environmentally Sensitive Lands**

## Florida Communities Trust Case Studies

**Acquisition General Obligation Bond Program** to purchase environmentally significant lands within its coastal high-hazard area, including the Juno Dunes Natural Area (271 acres) and the Paw-Paw Preserve (3 acres).

- Several communities have used funds from the **Florida Communities Trust** (FCT) program (see Sidebar 5.22 in Section 5.3) to purchase properties for both recreation and hazard mitigation purposes (see Sidebar 5.51). The FCT scoring criteria awards additional points for projects that (a) provide recreational opportunities and open space areas that direct residential and commercial development away from a coastal high-hazard area or a 100-year flood plain, or (b) are located within an area identified in the county's adopted **Local Mitigation Strategy** as a mitigation priority. Other funding sources are described in Sidebar 5.22.

### Post-disaster applications

The majority of post-disaster, fee-simple acquisition has been targeted at **developed properties that have suffered repetitive flood damage**. In some cases, the damaged structure is demolished, in others it may be relocated.

The principal funding sources used by Florida communities for "buyouts" of repetitively damaged property have included the federal Hazard Mitigation Grant Program or HMGP (see Sidebar 5.10 in Section 5.2) and the federal Flood Mitigation Assistance Program

Below are three local examples that show the versatility and importance of FCT funding to the implementation of land acquisition goals in local **Comprehensive Plans**.

### Wall Springs, Pinellas County Urban Wildlife Preserve

The 32-acre project site located in northwestern Pinellas County on St. Joseph Sound will be developed as an urban wildlife preserve. The project site is one of the last remaining undeveloped coastal properties in the county and will be incorporated into the adjacent Wall Springs Park. Adjacent to the Pinellas Trail, the park provides ancillary facilities and a destination point along the trail. Proposed facilities at the project site include a nature trail and wildlife observation platform. The total cost was \$6,987,417.

### City of Satellite Beach

In 1998, this 98% built-out coastal community with 9,600 residents recognized the loss of public beach access due to coastal construction and initiated a proactive program to identify and acquire the remaining undeveloped coastal properties within the city.

The city identified remaining undeveloped beachfront properties totaling 35.5 acres along 2.6 miles of oceanfront. Over a three-year period the city submitted three grant applications to FCT to acquire all the remaining open space along the beach. All three applications were approved, and FCT provided funding to purchase four parcels totaling 17.2 acres. This acquisition included the two largest undeveloped parcels along the city's beachfront. One parcel had an approved site plan for a 20-unit condominium;

the other an approved site plan for a 96-unit timeshare.

Spanning nearly one-fifth of the city's oceanfront, these properties now provide public open space and conservation land along the city's Atlantic coastline. In addition, the purchases have served to minimize the number of people and the amount of property at risk from coastal storms.

### City of Venice

Venice is fortunate to have almost four linear miles of coastline along the Gulf of Mexico, which is not obstructed by barrier islands. Due to this geography, however, the city is highly vulnerable to the storm surges, waves, and high winds of hurricanes and tropical storms, and most of the coastal areas of the city are within the CHHA.

In 2003, with the assistance of funding from FCT, the city acquired the Loufek property, one of the last undeveloped coastal properties within the city. The 0.90-acre property consisted of three residential lots with full views of the Gulf of Mexico. The site is located across the street from the Venice Municipal Beach Park.

The acquisition of this property met two important community needs:

- provide additional public beach parking and expand the recreational activities along the coastal area of the city; and
- reduce future development within the Coastal Construction Control Line area and the CHHA.

The 2001 **Sarasota County Unified Local Mitigation Strategy** was instrumental in providing justification for the FCT grant.

or FMAP (see Sidebar 5.41 in Section 5.4). Both programs require that local governments retain ownership of land that is purchased and that no permanent structures be constructed on that land. As illustrated in Sidebar 5.52, these buyouts can result in significant decreases in community vulnerability.

### Purchase-and-sellback or leaseback

Where a community wishes to significantly **reduce allowable densities of vacant land** in hazardous coastal areas and avoid takings or Bert Harris Act legal challenges (see Sidebars 5.1 and 5.2 in Section 5.1), purchase-and-sellback or purchase-and-leaseback strategies described in Section 5.1 offer lower-cost alternatives to fee-simple acquisition and retention by the local government.

Under the purchase-and-sellback option, the area is rezoned for the desired density and then sold for development. Under the purchase-and-leaseback option, the area is rezoned and subdivided by the local government and individual lots are leased for development. Both strategies can be applied in either pre-disaster or post-disaster settings. Neither HMGP nor FMAP funds can be used for such purposes because both require the local government to retain ownership of the land and use the land solely for open space and passive recreation.

### Purchase of development rights

Purchase of development rights (PDR) has potential applications for reducing develop-

#### Sidebar 5.52

### Acquiring Property to Eliminate Future Flood Losses in the Florida Panhandle

In July 1994, tropical storm Alberto dumped over 20 inches of rain on the Florida Panhandle. The subsequent riverine flooding required over \$500 million in federal disaster assistance. Over 500 houses, many damaged in previous floods, were destroyed. State and local officials decided that the best solution to the problem of repetitive losses was the removal or demolition of structures at risk.

The Florida Department of Community Affairs used emergency supplemental Community Development Block Grant (CDBG) funds to assist seven local governments to acquire a number of private properties that sustained major damage during the flood. CDBG funds were combined with HMGP money to provide a total of \$27.5 million to purchase 388 private parcels. In all, a total of 486 residential structures and 11 commercial buildings were demolished or relocated using federal funds.

Evidence of the success of this strategy was provided shortly thereafter. In the spring of 1998, the El Niño phenomenon brought heavy rain and flooding. Some river crests were higher than they were during Alberto, yet damages from the El Niño disaster were lower in the seven counties that acquired flood-prone properties (see Table 5.3).

**Table 5.3: Total federal funding amounts for individual and family grants and temporary housing assistance.**

| County        | TS Alberto         | El Niño          |
|---------------|--------------------|------------------|
| Calhoun       | \$1,112,563        | \$308,971        |
| Gadsden       | \$80,189           | \$1,178          |
| Holmes        | \$3,527,174        | \$287,714        |
| Washington    | \$2,336,883        | \$161,154        |
| <b>Total:</b> | <b>\$7,056,759</b> | <b>\$753,017</b> |

*Source: Florida Department of Community Affairs*

ment densities in hazardous areas. However, if the objective is to **preclude building** on vacant land **or reconstruction** in areas with substantial damage in a post-disaster setting, property owners are unlikely to be interested in retaining ownership of coastal property that cannot be

used for residential or commercial purposes. Thus, fee-simple acquisition is the norm.

PDR may have applications where the objective is to **reduce the density of new development** on vacant land in hazardous areas that is eligible for subdivision. In such cases, local

governments may purchase a portion of the development rights and allow development at significantly lower density. This is also the most likely scenario for the use of transfer of development rights (see next section).

### Transfer of development rights

Examples of applying the transfer of development rights tool for purposes of protecting environmentally sensitive resources and natural protective features in particular, are presented in Section 5.3. The approach is easily extended to circumstances where the objective is to **preclude development or reduce allowable densities in hazardous areas**. An example of such an application of TDR is the California Coastal Commission's TDR program for the seismically active Santa Monica Zone (see Sidebar 5.53).

### Capital expenditure policies

As noted in Section 5.1, capital facilities **policies that limit the provision of such public facilities** as roads, water, and sewer can be employed to limit development densities. They are most effective where used in concert with zoning and subdivision regulations that directly regulate land use types and intensities.

The principal application in hazardous areas is to limit public expenditures for facilities and infrastructure that will be exposed to hazard forces and, therefore, vulnerable to damage that will impose costs on the local government for repair and reconstruction. Critics have argued

#### Sidebar 5.53

### California Coastal Commission: TDR in the Santa Monica Seismic Zone

The California Coastal Commission TDR program requires developers of new subdivisions to purchase development credits for each new lot that is created by subdivision. Credits are purchased from buildable lots of 20 acres or more in size within existing subdivisions that are located in areas vulnerable to ground shaking or land slides in the event of an earthquake.

The area is divided into three zones. Transfers in Zones I and III operate solely through the private market (passive TDR). In Zone II, developers can make in-lieu payments to the Mountains Restoration Trust, which can then purchase development rights from marginal properties. The Trust also can receive charitable donations of credits and can sell credits.

*Source: Johnston and Madison (1997).*

that other taxpayers are subsidizing development in hazardous areas where property owners who benefit from such services do not bear the full costs of paying for initial capital expenses as well as the local expenses of repair and reconstruction.

This argument is the basis for Florida's rule that requires coastal communities to include objectives in their *coastal elements* and their *capital improvements elements* that limit public expenditures for infrastructure and public facilities that "subsidize development" in Coastal High-Hazard Areas (CHHAs). For example:

- Manatee County requires private financing of infrastructure within CHHAs.
- Escambia County's *coastal management element* includes policies governing public expenditures in CHHAs (Policy 11.A.5.2) and public facilities criteria (Policy 11.A.5.3) that reflect the need to fulfill local government concurrency obligations while also limiting development in hazardous areas (see Sidebar 5.54).

### Education and information

A broad-based public education and information program designed to inform the public about natural hazards and what they can do about them also can serve as the basis for raising the salience of hazards in the public's minds and for building and maintaining support for new and existing strategies for managing development and redevelopment.

## Sidebar 5.54

## Escambia County Public Facilities Policies

**Policy 11.A.5.2: Public Expenditures in CHHA**

*Public expenditures within the coastal high hazard area will be limited to the provision or support of recreation uses such as parks and walkovers, erosion control devices, increase public access and the correction of deficiencies, and to support infrastructure, provided, however, that infrastructure sizing is consistent with that needed to support the densities and intensities established by this plan for those areas within the CHHA.*

*The county shall, by ordinance, provide for funding sources for infrastructure improvements necessitated as a result of concurrency and hurricane evacuation standards including but not limited to the creation of tax increment financing districts. . . . The identification and availability of such funding shall be a prerequisite to approval of any development that requires an increase or expansion of infrastructure.*

**Policy 11.A.5.3 Public Facilities Criteria**

*New public facilities shall not be located in the coastal high hazard area unless the following criteria are met:*

1. *The facility is necessary to protect human lives or preserve important natural resources; or*
2. *The service provided by the facility cannot be provided at another location outside the CHHA; and*
3. *The facility is designed to provide the minimum capacity necessary to meet level of service standards for its service area and its sizing is consistent with the densities and intensities reflected on the future land use map.*

Several examples described in earlier sections could be extended in this manner, including the following:

- the Florida Department of Environmental Protection's (FDEP) booklet, Homeowner's Guide to Wetlands, for educating property owners about wetlands and the state's wetland regulatory programs (see Sidebar 5.27 in Section 5.3); and
- the FDEP's "Building Back the Sand Dunes" public education brochure (see Sidebar 5.28 in Section 5.3).

Miami-Dade's storm-resistant landscaping initiative, described in part above, offers an example of combining public education and regulation. It is a multi-part program that includes among other elements:

- a poster to educate property owners about storm resistant landscaping vegetation developed by the Miami-Dade County Department of Environmental Resource Management in partnership with the South Florida Water Management District;
- a landscape manual that identifies trees that can best withstand flooding, drought, and wind; and
- an ordinance that restricts the planting of trees that are prohibited because they do not meet these standards.

**Fill in the Gaps and Putting it all Together**

Section 6.0, which follows, presents guidelines for communities that do not have **Post-Disaster Redevelopment Plans (PDRP)** and for non-coastal counties that have limited hazard mitigation and post-disaster redevelopment components in their **Comprehensive Plans**. Section 6.1 describes the recommended components of a **PDRP** as well as two model ordinances and a model **PDRP** that are included in the Appendices of this guidebook. Section 6.2 presents specific **Comprehensive Plan** inventory and analysis components, goals, objectives, and policies that incorporate the best practices described elsewhere in this guidebook.

Section 7.0, illustrates how a number of the land use planning and development management practices described in Section 5.0 could be applied to a hypothetical coastal community, Calamity Shores.

# 6 Fill in the Gaps in Hazard Mitigation and Post-Disaster Redevelopment Planning

While there are explicit mandates in Florida's growth management legislation and comprehensive planning regulations that direct coastal communities to develop *Post-Disaster Redevelopment Plans (PDRPs)* and to address hazard mitigation in the coastal elements of their *Comprehensive Plans*, non-coastal communities have no such requirements.

Many of the *PDRPs* developed by coastal communities tend to focus solely on operational procedures, which largely repeat the content of the *Recovery Annex* of their *Comprehensive Emergency Management Plans*. In addition, the hazard mitigation mandates that apply to coastal communities only address coastal storms. Non-coastal flooding is addressed only to a limited extent in state regulations governing the *future land use element*.

Given these gaps, the following initiatives are recommended for harnessing the power of a *PDRP* and a *Comprehensive Plan* to more effectively mitigate community vulnerability to natural hazards.

- ✓ Adopt a *PDRP* to guide recovery operations and post-disaster redevelopment decision making.
- ✓ Fully address hazard mitigation and post-disaster redevelopment in the *Comprehensive Plan*.

## Section 6.1: Adopt a *PDRP* to Guide Recovery Operations and Post-Disaster Redevelopment Decision Making

While every county in Florida includes a *Recovery Annex* in their *Comprehensive Emergency Management Plan*, most cities and counties have not adopted a formal *PDRP* that addresses both recovery operations and policies intended to guide post-disaster reconstruction and redevelopment decision making.

As noted in Section 2.5, coastal communities are required to include an objective in the *coastal management element* of their *Comprehensive Plan* in which they state their intent to prepare a *PDRP*, while non-coastal communities are encouraged in state statute to prepare *PDRPs* as well.

- The state regulations governing the *coastal management element* state that the purpose of the *PDRP* is to “reduce or eliminate exposure of human life and public and private property to natural hazards” (§9J-5.012(3)(b)(8) *F.A.C.*).
- The state statute recommends that “[t]hese plans should, at a minimum, establish long-term policies regarding redevelopment, infrastructure, densities, nonconforming uses, and future land use patterns” (§163.3177(7)(l) *F.S.*).

Little guidance, beyond these directives, is provided concerning the ideal content of such a plan. The most useful *PDRPs* detail recovery and redevelopment operations as well as forth policies from the community's *Comprehensive Plan* and land development code that should guide the reconstruction and redevelopment process after a disaster.

A community with an effective *PDRP* is in a position to achieve a more rapid recovery and may be able take advantage of opportunities to rebuild in a manner that is more disaster resistant.

- *PDRPs* are a valuable operations tool because they can provide a single, free-standing guide to action and decision making during the often high-pressure and tumultuous disaster recovery period when sifting through the relevant sections of several different plans is a luxury most decision makers don't have the time to exercise.
- *PDRPs* are important instruments for helping to reduce community vulnerability to future disasters because disasters may create opportunities for redevelopment that furthers hazard mitigation goals and objectives.
- Disasters may present opportunities to advance other community redevelopment objectives. Where these opportunities are anticipated in a *PDRP*, a community will be better positioned to take advantage of them.

This section identifies the key operations and policy components of a **PDRP**. A model plan and examples of ordinances that adopt policies and procedures to facilitate the post-disaster reconstruction and redevelopment process are also presented.

### Recommended components of a **PDRP**

The recommendations in this section are adapted from those presented in the American Planning Association's Planning Advisory Service Report 483/484, *Planning for Post-Disaster Recovery and Reconstruction* (Schwab et al., 1998).

#### Authority, organization, and operations policies and procedures

This section defines which local agencies or organizations are responsible for specific activities and the operational procedures and policies that should govern implementation of the policies in the **PDRP**. These elements of the plan should be formalized through adoption of an ordinance by the local governing body. Operational procedures may be a separate ordinance, such as one of those presented in Appendix C, or the entire plan may be adopted as an ordinance.

This section of the **PDRP** and the post-disaster redevelopment ordinance should:

- **Designate the lead agency** responsible for coordinating the reconstruction and redevelopment process and ensuring conformance with the policies and procedures of the **PDRP**.
- **Create and empower a post-disaster redevelopment task force** responsible for developing the **PDRP** and for implementing it under the oversight of the lead agency.
- **Define operations policies and procedures** that detail which local agencies and organizations are responsible for specific recovery, reconstruction, and redevelopment tasks, who reports to whom, required coordination with state, federal, and private agencies and organizations, and the policies that govern operational decisions. This will incorporate the short-term recovery tasks typically encompassed by the Recovery Annex of the local **Comprehensive Emergency Management Plan (CEMP)**, but it should also cover long-term recovery and redevelopment tasks as well.
- **Define the plan preparation, review, and revision process**, including provisions for participation by individuals and groups in the community with important stakes and/or roles to play in the recovery and redevelopment process.

### Short-term response and recovery rehabilitative functions

These functions include the immediate actions needed to begin the recovery process and the short-term recovery actions that are intended to reconstruct the community, as it existed prior to a disaster. Many of these functions are likely to be included in the **Recovery Annex** of the community's **CEMP**.

- **Provision of temporary shelter** for residents whose houses cannot be re-occupied without repairs. The **PDRP** should address what types of temporary housing may be provided and sited consistent with the community's land use patterns and zoning regulations.
- **Policies and procedures for debris management and disposal**, including the following:
  - **criteria for pre-disaster contracts for debris clearance, collection, and disposal,**
  - **operational policies that stipulate debris clearance priorities, and**
  - **identification of appropriate sites for temporary storage and ultimate disposal of different categories of debris.**
- **Preliminary damage assessment procedures and policies** that define the damage categories to be employed and the criteria for each category.
- **Restoration of utility services**, including priorities for the sequence of service

restoration and policies governing coordination with private utilities.

- **Establishment of reconstruction priorities** for damaged public buildings and facilities.
- **Policies governing demolition** of structures that pose an imminent danger to public health and safety.
- **Policies governing re-occupancy of damaged habitable structures.**
- **Policies governing emergency repairs to private structures.**
- **Policies governing repair and reconstruction of non-conforming structures.**
- **Policies governing demolition, repair, and reconstruction of historic structures.**
- **Policies governing the issuance of development and building permits** including the following:
  - **imposition of an initial moratorium on processing of new development and building permits, and**
  - **conditions under which the moratorium is lifted for new construction versus repair of damaged structures and for structures that have experienced different levels of damage.**

### **Long-term redevelopment and mitigation tasks and policies**

These are the policies that guide decisions to redevelop the community in ways different from the way it was before the disaster.

- **Reassessment of the community's exposure and vulnerability** based on damage incurred during the disaster.
- **Reassessment of the adequacy of evacuation and emergency shelter infrastructure and facilities.**
- **Reassessment of the future land use element, building code, and land development regulations** based on new knowledge about exposure, vulnerability, evacuation, and shelter demand.
- **Policies governing redevelopment** of areas that have experienced substantial damage including (a) those with repetitively damaged private property and public facilities and infrastructure and (b) those in which substantial damage was not anticipated:
  - **opportunities to mitigate vulnerability through compliance with revised building code and land development regulations;**
  - **opportunities to mitigate vulnerability through strategies to make the environment less hazardous;**
  - **opportunities to mitigate vulnerability by redeveloping the area for different uses; and**

- **opportunities to achieve other community redevelopment objectives by redeveloping the area for different uses.**

### **Incorporation of components from other plans**

The foregoing sections identify a number of procedures and policies that should be included in the *PDRP* that overlap with components of the local *CEMP*. If the *PDRP* is to serve as the primary reference for guiding post-disaster operations and decision making, it is important that it replicate or, at the least, provide a crosswalk to critical information from the community's *Comprehensive Plan* and *Local Mitigation Strategy (LMS)* including the following.

- **Comprehensive Plan future land use element:**
  - **existing land use map, including depiction of wind, flood, and other natural hazard zones;**
  - **future land use map, including depiction of natural hazard zones and areas in need of redevelopment;**
  - **inventory of public facilities and infrastructure within 100-year special flood hazard areas and coastal high-hazard areas;**
  - **inventory of private structures and public facilities with a history of repeated damage from natural disasters;**

## Sidebar 6.1

## A Model Recovery and Redevelopment Ordinance

A model recovery and redevelopment ordinance published in the American Planning Association's 1998 Planning Advisory Service Report #483/484, is presented in Appendix C-2. This ordinance contains the basic elements required for establishing a recovery organization, and authorizing a variety of pre- and post-event planning and regulatory powers and procedures related to disaster recovery and redevelopment. Designed to be adopted in advance of a major disaster, the ordinance greatly facilitates long-term recovery and the implementation of redevelopment opportunities identified in the **PDRP**.

The essential concepts of the model ordinance include:

- the establishment of a recovery organization, such as a Redevelopment Task Force, that will prepare a **Post-Disaster Redevelopment Plan (PDRP)**;
- the adoption of that plan and this ordinance by the governing body before a major disaster occurs; and
- the use of the **PDRP** by the Task Force to efficiently and effectively guide post-disaster recovery and redevelopment.

The model ordinance language is interspersed with italicized commentaries that provide alternatives or clarification. These have been supplemented to address the context within which Florida hazard mitigation and post-disaster redevelopment planning is done.

- inventory of beach and dune areas and river shores susceptible to erosion from coastal storms and floods;
- inventory of erosion protection structures;
- development suitability analysis for vacant and undeveloped land;
- policies that distinguish between immediate repair and cleanup actions needed to protect public health and safety and long-term repair and reconstruction activities that should be subject to different review and approval processes;
- policies governing the repair and alteration of private structures that do not conform to current building code standards or zoning regulations; and
- policies intended to guide redevelopment of specific areas, including elimination or reduction of exposure and vulnerability to natural hazards through development regulation, public acquisition, and publicly-financed redevelopment initiatives.
- **Comprehensive Plan capital improvements element:**
  - the five-year schedule of capital improvement projects; and
  - policies that address the removal, relocation, and structural modification of damaged public facilities and infrastructure.
- **Local building and development codes:**
  - zoning map, including overlay zones for hazard zones and natural protective features such as wetlands, floodplains, major natural drainage features, and beaches and dunes;
  - rules governing the repair and alteration of private structures that do not conform to current building code standards; and
  - rules governing the repair and alteration of private structures that do not conform to current zoning regulations.
- **LMS:**
  - prioritized list of mitigation projects.

### Model plans and ordinances

Model post-disaster ordinances and a model redevelopment plan are presented in Appendix C including the following:

- a model recovery and redevelopment ordinance from the American Planning Association's Planning Advisory Service Report with some additional commentary to place it within the Florida context (see Sidebar 6.1);
- the Hillsborough County, Florida, ordinance (see Sidebar 6.2); and
- the Okaloosa County **PDRP** (see Sidebar 6.3).

## Sidebar 6.2

### Hillsborough County Redevelopment Ordinance (Number 93-20)

Hillsborough County adopted a redevelopment ordinance in 1993 to guide redevelopment and hazard mitigation in the unincorporated areas of the county. The ordinance provides for the creation of a task force, procedures for assessing damage, a build-back policy, a building moratorium, and explains the types of emergency repairs allowed. See Appendix C-3 for the complete ordinance.

## Sidebar 6.3

### Okaloosa County Post- Disaster Redevelopment Plan

Okaloosa County prepared this plan in late summer 1995 but had not yet formally adopted it when Hurricane Opal struck in October 1995. The plan addresses both recovery operations as well as policies for guiding the reconstruction and redevelopment process. It sets forth explicit policies governing the repair and reconstruction of structures that sustain different levels of damage within the **Coastal High-Hazard Area (CHHA)** and **Hazard Vulnerability Zone (HVZ)**. It also spells out specific initiatives to be pursued to reduce post-storm densities and vulnerability within the CHHA. See Appendix C-4 for the complete plan.

## Section 6.2: Fully Address Hazard Mitigation and Post- Disaster Redevelopment in the *Comprehensive Plan*

This guidebook has identified a number of initiatives that can be taken by local governments to more effectively use the *Comprehensive Plan* as one of the primary tools for making Florida communities more resistant and resilient to damage and injuries from coastal storms and associated flooding. This section identifies specific *Comprehensive Plan* inventory and analysis components, goals, objectives, and policies that incorporate these best practices. Examples of both regulatory and non-regulatory strategies are included.

As detailed in Sidebar 6.4, local governments in Florida have the authority to extend the reach of their *Comprehensive Plans* beyond the requirements set forth in Chapter 163, *Florida Statutes*, and Chapter 9J-5, *Florida Administrative Code*. These “best practices” are recommended for enhancing local *Comprehensive Plans*.

The following sections are organized by plan element. Relevant citations to the 9J-5, *F.A.C.*, are included for reference. Plan components that are targeted at coastal flooding and the requirements that apply only to coastal counties are presented in bold typeface. All other components apply to wind hazards and non-coastal flooding and are appropriate to the *Comprehensive Plans* of both coastal and non-coastal communities.

## Sidebar 6.4

### Local Authority to Go Beyond State Planning Mandate Minima

Chapter 163, Florida Statutes, clearly affirms the power of local governments to plan and regulate the use of land (§163.3161(8), *F.S.*):

It is the intent of the Legislature that the repeal of ss. 163.160 through 163.315 by s. 19 of chapter 85-55, Laws of Florida, shall not be interpreted to limit or restrict the powers of municipal or county officials, but shall be interpreted as a recognition of their broad statutory and constitutional powers to plan for and regulate the use of land.

This is reiterated in the state regulations governing the preparation of local *Comprehensive Plans* (§9J-5.001(4), *F.A.C.*):

As minimum criteria, these criteria are not intended to prohibit a local government from proposing, considering, adopting, enforcing, or in any other way administering a *Comprehensive Plan* which is more specific, detailed, or strict, or which covers additional subject areas, whether within required or optional elements, as long as the *Comprehensive Plan* is in compliance with Chapter 9J-5, *F.A.C.*, Chapter 163, *F.S.*, and any other applicable statutes, laws or rules.

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### ***Coastal management element***

***Inventory and analysis:*** Identify ***coastal high-hazard areas*** and inventory public facilities and infrastructure within them.

Analyze the potential for replacing, mitigating, or relocating vulnerable public facilities and infrastructure within the ***coastal high-hazard area***.

Analyze hurricane evacuation and shelter needs within the ***hurricane vulnerability zone***.

Analyze the effects of development proposed in the ***future land use element*** on population densities within the ***hurricane vulnerability zone*** and on populations with special hurricane evacuation needs.

Identify measures that can be used to maintain or reduce hurricane evacuation times.

Inventory beach and dune systems and analyze erosion and accretion trends and the effects of shore protection structures.

Inventory existing and potential beach renourishment areas and identify measures to protect and restore beaches and dunes.

***Goal 1:*** Maintain and enhance the natural hazard protection functions of coastal wetlands and beaches and dunes [see ***Future land use element*** Goal 2].

***Objective 1.1:*** Protect and conserve the natural functions of coastal wetlands and beaches and dunes [see ***Future land use element*** Objective 2.1].

***Objective 1.2:*** Restore the natural functions of degraded coastal wetlands and beach and dune systems [see ***Future land use element*** Objective 2.2].

***Goal 2:***

***Objective 2.1:***

Protect human life from coastal storm hazards.

Maintain or reduce hurricane evacuation clearances times to a maximum of \_\_\_\_ hours and assure provision of adequate emergency shelter capacity for residents within the ***hurricane vulnerability zone***.

***Policy 2.1.1:*** Establish an evacuation clearance time level of service standard consistent with the standard defined in Objective 2.1 and require that adequate evacuation route capacity to maintain that standard is in place prior to approving additional residential development within the ***hurricane vulnerability zone*** [see ***Future land use element*** Policy 3.1.1].

***Policy 2.1.2:*** Establish an emergency shelter capacity level of service standard and require that adequate shelter capacity to maintain that standard is in place prior to approving additional residential development within the ***hurricane vulnerability zone*** [see ***Future land use element*** Policy 3.1.2].

***Policy 2.1.3:*** Prohibit new “special needs” facilities within the ***coastal high-hazard area*** [or Category 1 and Category 2 evacuation zones; or on all barrier islands] and the expansion of existing special needs facilities including adult congregate living facilities, hospitals, nursing homes, homes for the aged, total care facilities, and others that are likely to require extraordinary efforts to evacuate in the event of a tropical storm or hurricane.

***Policy 2.1.4:*** Require submission and approval of an evacuation and sheltering plan as a condition

for approval of the construction of special needs facilities within the **coastal high-hazard area** [or Category 1 and Category 2 evacuation zones; or on all barrier islands].

**Policy 2.1.5:** Prohibit the placement of new manufactured homes/mobile homes within the **coastal high-hazard area** [or Category 1 and Category 2 evacuation zones; or on all barrier islands].

**Policy 2.1.6:** Prohibit the repair or replacement of non-conforming special needs facilities and manufactured homes/mobile homes that are damaged more than \_\_\_ percent of the value of the existing structure within 12 months.

**Policy 2.1.7:** Initiate a grant (or loan) program to assist owners of manufactured homes/mobile homes located within the **coastal high-hazard area** [or Category 1 and Category 2 evacuation zones; or on all barrier islands] with the financial costs of relocation.

**Policy 2.1.8:** Levy an impact fee on all new residential development to finance the residents' proportional share of new public emergency shelter space and the expansion of evacuation route highways, bridges, and causeways required to maintain an evacuation clearance time the standard set in Objective 2.1.

**Policy 2.1.9:** Levy a special assessment on all residential property within the city/county to finance the provision and maintenance of public emergency shelters and the planning and delivery of evacuation services. The assessment rate shall be based on the annual probability of evacuation of

the residential structure as a function of its type and location.

**Policy 2.1.10:** Create special assessment districts as necessary to finance the maintenance of evacuation route infrastructure that is subject to chronic erosion and/or coastal storm damage.

**Policy 2.1.11:** Coordinate coastal planning area population densities with the applicable local or regional hurricane evacuation plan [see also **Future land use** Policy 3.1.1].

**Policy 2.1.12:** Employ fee-simple acquisition and re-subdivision at lower densities in **coastal high-hazard areas** where hurricane evacuation clearance times exceed the standard set in Objective 2.1.

### **Goal 3:**

Minimize the exposure of human life and private property to coastal hazards.

#### **Objective 3.1:**

Ensure that all new construction and structures that are substantially altered or repaired (more than 50% of the value of the existing structure within 12 months) are in conformance with the minimum wind-borne debris and flood protection standards of the Florida Building Code [see **Future land use element** Objective 1.1].

#### **Objective 3.2:**

Adopt local building code standards that exceed the minimum wind-borne debris and flood protection standards of the Florida Building Code and the minimum coastal flood protection standards of the Florida Coastal Construction Control Line permit program [see **Future land use element** Objective 1.2].

|                                |                                                                                                                                                                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Objective 3.3:</b>          | Encourage and facilitate retrofitting of existing habitable structures to comply with or exceed current wind-borne debris and flood protection building code standards [see <i>Future land use element</i> Objective 1.3].             |
| <b>Objective 3.4:</b>          | Encourage the construction of safe rooms in new and existing residential structures outside of 100-year special flood hazard zones and landward of the Category 3 storm surge zone [see <i>Future land use element</i> Objective 1.4]. |
| <b>Objective 3.5:</b>          | Reduce the generation of wind-borne debris from private landscape vegetation [see <i>Future land use element</i> Objective 1.5].                                                                                                       |
| <b>Objective 3.6:</b>          | Direct population concentrations away from <i>coastal high-hazard areas</i> [see <i>Future land use element</i> Objective 1.6].                                                                                                        |
| <b>Goal 4:</b>                 | Minimize costs of wind and flood damage to public facilities and infrastructure in areas exposed to coastal storms [see <i>Capital improvements element</i> Goal 1].                                                                   |
| <b>Objective 4.1:</b>          | Minimize damage to public facilities and infrastructure from coastal flooding [see <i>Capital improvements element</i> Objective 1.1]                                                                                                  |
| <b>Relevant 9J-5 sections:</b> | Inventory and analysis requirements: §§9J-5.012(2)(b),(e), (f), and (h).<br><br>Requirements for goals, objectives and policies: §§9J-5.012(3)(a), (b)(4)-(7), (c)(1)-(5), (7)-(8).                                                    |

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### **Conservation element**

|                                |                                                                                                                                                                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Inventory and analysis:</b> | Inventory <i>coastal</i> and non-coastal wetlands, 100-year floodplains, and <i>beaches and dunes</i> , and analyze the potential for their use, conservation, and protection.                                                          |
| <b>Goal 1:</b>                 | Maintain and enhance the natural hazard protection functions of <i>coastal</i> and non-coastal wetlands, floodplains, and <i>beaches and dunes</i> [see <i>Future land use element</i> Goal 2].                                         |
| <b>Objective 1.1:</b>          | Protect and conserve the natural functions of <i>coastal</i> and non-coastal wetlands, floodplains, and <i>beaches and dunes</i> [see <i>Future land use element</i> Objective 2.1].                                                    |
| <b>Objective 1.2:</b>          | Restore the natural functions of degraded <i>coastal</i> and non-coastal wetlands, floodplains, and <i>dunes</i> [see <i>Future land use element</i> Objective 2.2].                                                                    |
| <b>Relevant 9J-5 sections:</b> | Inventory and analysis requirements: §§9J-5.013(1)(a) and (b) and <b>§§9J-5.012(2)(b)</b><br><br>Requirements for goals, objectives and policies: §§9J-5.013(2)(a), (b), and (c)(6); §9J-5.013(3); and <b>§§9J-5.012(3)(c)(1)-(2)</b> . |

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### **Future land use element**

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| <b>Inventory and analysis:</b> | Complete inventories of <ul style="list-style-type: none"> <li>- public facilities and infrastructure within 100-year special flood hazard areas and <i>coastal high-hazard areas</i>;</li> <li>- private structures and public facilities with a history of repeated damage from natural disasters;</li> </ul> |
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- *beach and dune areas and river shores susceptible to erosion from coastal storms and floods;* and
- erosion protection structures.

Depict the following on the existing and future land use maps or map series:

- wetlands;
- 100-year floodplains;
- areas subject to wind-borne debris from hurricane winds of different speeds;
- *areas subject to coastal flooding;*
- *coastal high-hazard areas;*
- major natural drainage features (e.g., drainage features inundated by a 25-year storm event);
- locations of public and private structures that have experienced repetitive flood damage; and
- areas in need of redevelopment.

Incorporate by reference the hazard identification and vulnerability assessment in the *Local Mitigation Strategy*.

Analyze the suitability of existing vacant and undeveloped land for use based on soils; topography; natural resources, including *coastal* and non-coastal wetlands, major natural drainage features, and *beaches and dunes*; historic resources; exposure to *coastal* and non-coastal flooding and erosion; and exposure to wind-borne debris from coastal storms.

Analyze the effects of proposed development and redevelopment of *coastal* and non-coastal flood prone areas on the vulnerability of private property and public facilities and infrastructure to damage from wind-borne debris and flooding.

#### **Goal 1:**

##### **Objective 1.1:**

Analyze the effects of population densities, including special needs populations, associated with proposed development and redevelopment, on evacuation clearance times.

Minimize the exposure of human life and property to damage and injury from wind and flooding.

Ensure that all new construction and structures that are substantially altered or repaired (more than 50% of the value of the existing structure within 12 months) are in conformance with the minimum wind-borne debris and flood protection standards of the Florida Building Code.

**Policy 1.1.1:** Enforce all provisions of the Florida Building Code.

**Policy 1.1.2:** Develop a mandatory training program for building inspectors based on the Florida Building Code requirements.

##### **Objective 1.2:**

Adopt local building code standards that exceed the minimum wind-borne debris and flood protection standards of the Florida Building Code *and the minimum coastal flood protection standards of the Florida Coastal Construction Control Line permit program.*

**Policy 1.2.1:** Require that all habitable structures be constructed to withstand the impact of wind-borne debris from wind speeds of \_\_\_\_ miles per hour (3-second gust ASCE 7-98 standard).

**Policy 1.2.2:** Require that the first-floors of all habitable structures located within the 100-year special flood hazard area (A-zone), as defined on Flood Insurance Rate Maps produced by the

National Flood Insurance Program, be elevated to \_\_\_\_ feet above the base flood elevation.

**Policy 1.2.3:** Require that the bottom of the lowest horizontal structural member of the first-floors of all habitable structures located within special flood hazard areas inundated by the 100 year flood in coastal areas (A-zone), as defined on Flood Insurance Rate Maps produced by the National Flood Insurance Program, be elevated to the base flood elevation.

**Policy 1.2.4:** Require that the bottom of the lowest horizontal structural member of the first-floors of all habitable structures located within special flood hazard areas inundated by the 100-year flood and which support a 3 foot wave or coastal floods with velocity hazards (V-zone), as defined on Flood Insurance Rate Maps produced by the National Flood Insurance Program, be elevated to \_\_\_\_ feet above the base flood elevation.

**Policy 1.2.5:** Require that the first-floors of all habitable structures located within the area demarcated by the Coastal Construction Control Line (CCCL), as defined by the Florida Department of Environmental Protection (FDEP), be elevated to \_\_\_\_ feet above the minimum elevation required under the FDEP CCCL permit regulations.

**Policy 1.2.6:** Require the construction of “safe rooms” in all new single-family residential detached dwelling units located outside of 100-year special flood hazard zones and *landward of the Category 3 storm surge zone*. Single-family attached units, such as townhouses, may be con-

#### **Objective 1.3:**

structed with a safe room or be engineered and constructed to meet a 130-mile per hour wind load.

Encourage and facilitate retrofitting of existing habitable structures to comply with or exceed current wind-borne debris and flood protection building code standards.

**Policy 1.3.1:** Initiate a grant (or loan) program to assist private property owners with the financial costs of retrofitting existing habitable structures with shutters to protect against damage from wind-borne debris.

**Policy 1.3.2:** Initiate a grant (or loan) program to assist private property owners with the financial costs of elevating, floodproofing, or relocating existing habitable structures that have experienced repetitive damage from flooding within 100-year special flood-hazard zones as defined on Flood Insurance Rate Maps produced by the National Flood Insurance Program.

**Policy 1.3.3:** Initiate a public information and education program to inform private property owners about the benefits of retrofitting existing habitable structures with shutters and elevating existing structures within 100-year special flood hazard zones.

**Policy 1.3.4:** Initiate a hazard mitigation inspection program to assist private property owners in identifying cost-effective mitigation measures for habitable structures.

#### **Objective 1.4:**

Encourage the construction of safe rooms in new and existing residential structures outside of 100-

year special flood hazard zones and *landward of the Category 3 storm surge zone*.

**Policy 1.4.1:** Permit a \_\_\_\_ percent increase in residential unit densities and a \_\_\_\_ percent increase in floor area ratios in subdivisions and PUDs in which safe rooms are constructed for all residential units.

**Objective 1.5:**

Reduce the generation of wind-borne debris from private landscape vegetation.

**Policy 1.5.1:** Adopt landscape standards for storm-resistant vegetation and apply those to all new private construction and re-landscaping of existing private property.

**Policy 1.5.2:** Initiate a public education program to encourage voluntary compliance with landscape guidelines for storm-resistant vegetation.

**Objective 1.6:**

Minimize/avoid/eliminate development within 100-year special flood hazard zones and *coastal high-hazard areas* [see also *Capital Improvements element* Objective 2.1].

**Policy 1.6.1:** Create overlay zones of 100-year special flood hazard zones and *coastal high-hazard areas*.

**Policy 1.6.2:** Designate the 100-year special flood hazard zones and *coastal high-hazard areas* for *preservation use* on the future land use map, and prohibit development within the overlay zones.

**Policy 1.6.3:** Prohibit alterations that increase the floor area of existing habitable structures within 100-year special flood hazard zones and *coastal high-hazard areas*.

**Policy 1.6.4:** Require dedication of easements of land within 100-year special flood-hazard zones and *coastal high-hazard areas* that prohibit development therein as a condition of subdivision and PUD plat approval and allow cluster development (within-parcel density transfer).

**Policy 1.6.5:** Where the extent of the 100-year special flood-hazard zone or the *coastal high-hazard area* is so great as to preclude development of vacant land at previously allowed densities, allow and facilitate transfer of development rights to designated receiving areas.

**Policy 1.6.6:** Where the extent of the 100-year special flood-hazard zone or the *coastal high-hazard area* is so great as to preclude any economically viable use of property, allow single-family residential development at a maximum density of 1 unit per \_\_\_\_ acres and allow and facilitate transfer of development rights to designated receiving areas to recover the value of previously allowed densities.

**Policy 1.6.7:** Where the extent of the 100-year special flood-hazard zone or the *coastal high-hazard area* is so great as to preclude any economically viable use of property, the city/county shall purchase the property in fee-simple.

**Policy 1.6.8:** Initiate a grant (or loan) program to assist private property owners with the financial costs of relocating existing habitable structures that are located within 100-year special flood hazard zones and *coastal high-hazard areas*.

**Policy 1.6.10:** Limit public expenditures that subsidize development within 100-year special flood-hazard zones and *coastal high-hazard areas* except for restoration or enhancement of public access to natural resources and *provision of essential services to water-dependent uses* [see also *Capital Improvements element* Policy 2.1].

**Policy 1.6.11:** Rezone land zoned for multi-family residential, condominium, and hotel and motel uses within the 100-year special flood-hazard zones and *coastal-high hazard areas* to low-density, single-family residential use.

**Policy 1.6.12:** Allow and facilitate transfer of development rights to designated receiving areas to recover the value of previously allowed densities for vacant land that is affected by Policy 1.6.11.

**Policy 1.6.13:** Prohibit expansion of non-conforming uses that result from Policy 1.6.11.

**Policy 1.6.14:** Prohibit repairs that exceed \_\_\_\_ percent of the value of the existing structure within 12 months for non-conforming uses that result from Policy 1.6.11, and allow and facilitate transfer of development rights to designated receiving areas to recover the value of previously allowed densities.

**Policy 1.6.15:** Use local, state, and federal funds for open space and recreation land acquisition to acquire land within 100-year special flood hazard zones and *coastal high-hazard areas* that can be used for passive or active public recreation and preclude development of hazardous areas.

**Objective 1.7:**

Minimize damage to private structures from chronic river and *coastal* shoreline erosion

**Policy 1.7.1:** Require the construction of all new habitable structures a distance equal to \_\_\_\_ times the average annual erosion rate along rivers with shifting banks and *along sandy coastal beaches*.

**Objective 1.8:**

Pursue opportunities to reduce the exposure of private property and public facilities and infrastructure to natural hazards during post-disaster recovery and reconstruction periods.

**Policy 1.8.1:** Distinguish between immediate repair and cleanup actions needed to protect public health and safety and long-term repair and reconstruction activities that should be subject to different review and approval processes.

**Policy 1.8.2:** Where repetitive damage of private property from flooding is widespread within 100-year special flood-hazard zones and/or *coastal high-hazard areas*, prepare redevelopment plans for the affected areas so as to reduce or eliminate development that exposes substantial numbers of people, private structures, and public facilities to future damage through such means as development regulation, public acquisition, relocation, and publicly-financed redevelopment initiatives.

**Policy 1.8.3:** Where repetitive damage of private property from flooding is scattered in isolated areas within 100-year special flood-hazard zones and *coastal high-hazard areas*, initiate a program for purchasing or elevating individual habitable structures that have experienced repetitive damage.

**Goal 2:**

Maintain and enhance the natural hazard protection functions of *coastal* and non-coastal wetlands, floodplains, and *beaches and dunes*.

**Objective 2.1:**

Protect and conserve the natural functions of *coastal* and non-coastal wetlands, floodplains, and *beaches and dunes*.

**Policy 2.1.1:** Limit the specific impacts and cumulative impacts of development and redevelopment on *coastal* and non-coastal wetlands, 100-year floodplains, and *beaches and dunes*.

**Policy 2.1.2:** Create overlay zones of *coastal* and non-coastal wetlands, 100-year floodplains, and *beaches and dunes*, designate the zone for preservation use on the future land use map, and prohibit development within the overlay zone.

**Policy 2.1.3:** Where the extent of wetland, floodplain, or *beach and dune* coverage is so great as to preclude development at previously allowed densities, allow transfer of development rights to designated receiving areas.

**Policy 2.1.4:** Where the extent of wetland, floodplain, or *beach and dune* coverage is so great as to preclude any economically viable use of property, allow single-family residential development at a maximum density of 1 unit per 40 acres and allow transfer of development rights to recover the value of previously allowed densities.

**Policy 2.1.5:** Require dedication of conservation easements for perpetual protection of *coastal* and non-coastal wetlands, 100-year floodplains, and *beaches and dunes* as a condition of subdivision

and PUD plat approval and allow cluster development (within parcel density transfer).

**Policy 2.1.6:** Require vegetated buffers of at least 50 feet around the margins of wetlands and floodplains and restrict/prohibit disturbance of those vegetated buffers.

**Policy 2.1.7:** Purchase conservation easements for wetlands and 100-year floodplains on developed property, where these features provide significant storm water management functions for 25-year or greater storm events, and where they are not protected by existing land development regulations, easements, or covenants.

**Policy 2.1.8:** Purchase conservation easements for dune systems where they are not protected by existing land development regulations, easements, or covenants.

**Policy 2.1.9:** Purchase in fee-simple major wetlands and 100-year floodplain areas where these features provide significant storm water management functions for 25-year or greater storm events, and where they cannot be feasibly protected through land development regulations, easements, or covenants and where they can serve passive or active public open space and/or recreation needs.

**Policy 2.1.10:** Purchase in fee-simple dune systems where they are not protected by existing land development regulations, easements, or covenants and where they can serve passive or active public open space and/or recreation needs.

**Objective 2.2:**

Restore the natural functions of degraded *coastal* and non-coastal wetlands, floodplains, and *beach and dune systems*.

**Policy 2.2.1:** Require the removal of exotic vegetation from wetlands, 100-year floodplains, and *dunes* as a condition of subdivision plat approval and/or the issuance of development permits.

**Policy 2.2.2:** Require the structural restoration of degraded dunes as a condition of subdivision plat approval and/or the issuance of development permits.

**Policy 2.2.3:** Coordinate with the U.S. Army Corps of Engineers and the State Department of Environmental Protection to provide for necessary renourishment of beach and dune systems that are subject to chronic erosion and storm damage and that provide significant protection from coastal storms.

**Policy 2.2.4:** Create special assessment districts as necessary to finance renourishment of beach and dune systems that are subject to chronic erosion and storm damage and that do not qualify for sufficient federal and state financial assistance.

**Goal 3:**

Protect human life from coastal storm hazards [see *Coastal management element* Goal 2].

**Objective 3.1:**

Maintain or reduce hurricane evacuation clearances times to a maximum of \_\_\_ hours and assure provision of adequate public shelter capacity for residents within the *hurricane vulnerability zone* [see *Coastal management element* Objective 2.1].

**Policy 3.1.1:** Establish an evacuation clearance time level of service standard consistent with the standard defined in Objective 2.1 and require that adequate evacuation route capacity to maintain that standard is in place prior to approving additional residential development within the *hurricane vulnerability zone* [see *Coastal management element* Policy 2.1.1].

**Policy 3.1.2:** Establish an emergency shelter capacity level of service standard and require that adequate shelter capacity to maintain that standard is in place prior to approving additional residential development within the *hurricane vulnerability zone* [see *Coastal management element* Policy 2.1.2].

**Policy 3.1.3:** Coordinate coastal planning area population densities with the applicable local or regional hurricane evacuation plan [see *Coastal management element* Policy 2.1.11].

**Relevant 9J-5 sections:**

Existing land use data requirements: §9J-5.006(1)(b).

Land use analysis requirements: §§9J-5.006(2)(b) and (e).

Future land use map requirements: §9J-5.006(4)(b) and **§9J-5.012(2)(b)**.

Requirements for goals, objectives, and policies: §§9J-5.006(3)(b)(4) **and (5)** and (3)(c)(1); §9J-5.011(2)(c)(4); **§9J-5.012 (2)(b); and §9J-5.012(3)(a), (b)(4)-(7), (c)(1)-(5), (7)-(8)**.

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***Sanitary sewer, solid waste, storm water management, potable water and natural groundwater aquifer recharge element***

***Inventory and analysis:*** Identify major natural drainage features (e.g., drainage features inundated by a 25-year storm event) and assess the adequacy of existing regulations governing land use and development of them.

***Goal 1:*** Reduce the exposure of people and property to damage and injury from flooding.

***Objective 1.1:*** Achieve comprehensive resolution of existing flood problems and avoid future problems from new development or redevelopment.

***Policy 1.1.1:*** Develop and fund a storm water master plan for the community, which includes storm water projects that would alleviate existing flooding problems and prevent future flooding problems.

***Policy 1.1.2:*** Participate in the Community Rating System of the National Flood Insurance Program and enact the recommendations for maintenance of drainage ways.

***Policy 1.1.3:*** Require the use of storm water best management practices so as to limit the volume of off-site storm water to pre-development levels. These may include (a) restoration of wetlands, 100-year floodplains, and natural drainage features that have been altered from their natural conditions, (b) use of design and construction techniques that minimize impervious surfaces, and (c) construction of drainage features and storm water detention and retention facilities.

***Objective 1.2:***

***Policy 1.1.4:*** Acquire land in fee-simple and construct storm water retention or detention facilities.

Protect and conserve major natural drainage features.

***Policy 1.2.1:*** Limit the specific impacts and cumulative impacts of development and redevelopment on major natural drainage features.

***Policy 1.2.2:*** Create an overlay zone of major natural drainage features (e.g., drainage features inundated by a 25-year storm event), designate the zone for ***preservation use*** on the future land use map, and prohibit development within the overlay zone.

***Policy 1.2.3:*** Where the extent of major natural drainage feature coverage is so great as to preclude development at previously allowed densities, allow transfer of development rights to designated receiving areas.

***Policy 1.2.4:*** Where the extent of major natural drainage feature coverage is so great as to preclude any economically viable use of property, allow single-family residential development at a maximum ***density of 1 unit per 40 acres and allow transfer of development rights to recover the value of previously allowed densities.***

***Policy 1.2.5:*** Require dedication of conservation easements for perpetual protection of major natural drainage features as a condition of subdivision and PUD plat approval and allow cluster development (within parcel density transfer).