Demolition

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

Demolishing a repetitively flooded home

Pilot Reconstruction

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction.

Retrofitting

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing

- Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.
- Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing

- The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Insurance

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures

in the process. Insurance offers the advantage of protecting the property, so long as the policy is in force, without requiring human intervention for the measure to work.

Private Property

- Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually, these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property

- Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

Local Implementation and CRS Credit

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. Orange County receives credit for Activity 520 – Acquisition and Relocation for removing buildings from the regulatory floodplain.

The CRS credits barriers and elevating existing buildings under Activity 530. Flood protection techniques that are recognized by this activity include retrofitting projects and structural flood control projects. The credit for Activity 530 is based on the combination of flood protection techniques used and the level of flood protection provided. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities. Orange County does not currently receive credit for Activity 530 – Flood Protection. County staff has the technical expertise to provide advice and assistance to homeowners who may want to flood proof their home or business. The FMPC recommends that the County continue to publicize technical assistance for Activity 360 Flood Protection Assistance.

Flood insurance information for the County is provided in Section 4.3.4. Orange County publicizes flood insurance through outreach brochures to floodplain residents and repetitive loss areas.
There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners and preparing plans to increase coverage. The CRS also reduces the premiums for those people who do buy NFIP coverage. Orange County currently receives credit for Activity 330 – Outreach Projects.

Conclusions

There are several ways to protect properties from flood damage. The advantages and disadvantages of each should be carefully examined for each situation.

Property owners can implement some property protection measures at little cost, especially for sites in areas of low-level flooding. The local government can promote and support this type of property protection through outreach, advice and assistance, and financial incentives.

Table B.2 – Property Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures Considered by FMPC			
-	Increase flood insurance policy coverage throughout the County	This outcome will be pursued through broader public information and outreach actions.	n/a
Prevention Measures and Funding Recommended for Implementation			
1	Encourage residents through outreach and education projects to consider the benefits of acquisition or elevation.	Repetitive loss properties are likely to continue incurring losses without mitigation. Acquisition and demolition is the only way to guarantee no future losses occur.	HMGP
8	Consider options for public/private partnership with home improvement stores to encourage homeowners to take mitigation and preparedness actions.	Home improvement stores can help to educate property owners on ways to protect their property from flooding and incorporate mitigation of their property into flood recovery.	Operating budget

B.1.3 Natural Resource Protection

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Seven areas are reviewed:

- Wetland protection
- Erosion and sedimentation control
- Stream restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetland Protection

Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, improving water quality, and they provide habitat for many species of fish, wildlife, and plants.

Erosion and Sedimentation Control

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more sediment is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to perform their job, but the sediment in the water reduces light, oxygen and water quality, and often carries chemicals, heavy metals and other pollutants. Sediment has been identified by the US EPA as the nation's number one nonpoint source pollutant for aquatic life.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Erosion and sedimentation control regulations mandate that these types of practices be incorporated into construction plans. The most common approach is to require permit applicants to submit an erosion and sediment control plan for the construction project. This allows the applicant to determine the best practices for the site.

Stream Restoration

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water

- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Best Management Practices

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

Dumping Regulations

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regarding their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Farmland Protection

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes cropland, rangeland, grassland, pastureland, or forest land that is part of an agricultural operation. Certain lands within historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation:

- Farmland is preserved for future generation,
- Farmland in the floodplain keeps damageable structures out of harm's way
- Farmland keeps more stormwater on site and lets less stormwater runoff downstream
- Rural economic stability and development is sustained
- Ecosystems are maintained, restored, or enhanced
- The rural character and scenic beauty of the area is maintained

Local Implementation and CRS Credit

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. Orange County currently receives credit for Activity 420 – Open Space Preservation for open space preservation, natural functions open space, and open space incentives.

Orange County's Land Development Code contains a section on wetland conservation areas that specifies the characteristics of wetlands that should be considered conservation lands. All development applications subject to wetland conservation regulations that would have an adverse impact on wetlands are required to mitigate those impacts.

The County's comprehensive plan has several natural resource protection and restoration policies including an ongoing aim to inventory and prioritize lake restoration and uphold state and federal quality standards and protect shoreline vegetation by restricting the removal of desirable native vegetation through implementation of the Land Development Code and the Lakeshore Protection Ordinance requirements.

Credit is available for the Erosion and Sediment Control (ESC) element under Activity 450 for regulating activities throughout the watershed to minimize erosion on construction sites that could result in sedimentation and water pollution. Orange County currently receives credit under the ESC element for Activity 450 – Stormwater Management for stormwater management regulations, erosion and sediment control regulations, and water quality regulations.

Since June 2003 Orange County requires that all sites disturbing 1 or more acres must have an "NPDES Construction General Permit" through the Florida Department of Environmental Protection. FDEP has been delegated authority by the EPA to administer and enforce the program. A stormwater pollution prevention

CRS credit is provided to communities that keep streams, channels and storage basins clear of debris so that flood carrying capacity is maintained. Orange County does not currently receive credit under Activity 540 – Drainage System Maintenance. Credit is provided under the Stream Dumping Regulations (SDR) element if the community has and publicizes regulations prohibiting dumping in streams and ditches. Orange County previously received credit for having an ordinance in place which made it unlawful for anyone to deposit waste, grass, weeds, brush or other refuse in any street, ditch or watercourse, or on others' property,

or on public property. It is suggested that the County review opportunities for reinstating credit under this element.

Conclusions

There are several ways to protect properties from flood damage. The advantages and disadvantages of each should be carefully examined for each situation.

Property owners can implement some property protection measures at little cost, especially for sites in areas of low level flooding. The local government can promote and support this type of property protection through outreach, advice and assistance, and financial incentives.

Table B.3 – Natural Resource Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Natural Resource Protection Measures Considered by FMPC			
-	Educate the public on natural resource protection and nonpoint source pollution prevention.	This action will be integrated into broader public information and outreach actions.	n/a
-	Identify parcels not well suited for development and encourage a public/private partnership to maintain them as open space.	The County already pursues open space preservation through its Green PLACE program, which is being recommended for continuation and expansion.	n/a
Natural Resource Protection Measures and Funding Recommended for Implementation			
10	Coordinate open space opportunities with existing Green PLACE program, wetland preservation, and comprehensive plan policies.	Coordinating land conservation with long-term planning can serve to protect vulnerable lands and natural floodplain functions and mitigate future flooding.	Operating budget; Green PLACE program funding
12	Improve stormwater quality to ensure compliance with NPDES permit and pollutant TMDLs.	Managing runoff and reducing stormwater pollution protects surface waters and mitigates health risks of flooding.	Operating budget

B.1.4 Emergency Services Measures

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. At the state level, emergency services programs are coordinated by the Florida Department of Emergency Management (FDEM). Locally, Orange County's emergency services are coordinated by the Orange County Office of Emergency Management.

This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

Threat Recognition

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide notice of potential local or flash flooding.

Warning

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- CodeRed countywide mass telephone emergency communication system
- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Multiple or redundant systems are most effective because if people do not hear one warning, they may still get the message from another part of the system.

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

StormReady

The National Weather Service established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be designated StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars

- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a StormReady community by the National Weather Service is a good measure of a community's emergency warning program for weather hazards. It is also credited by the CRS. Orange County is credited by NOAA as a StormReady community.

Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

A flood stage forecast map shows areas that will be under water at various flood stages. Different flood levels are shown as color coded areas, so the emergency manager can quickly see what will be affected. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, and who to warn. With this information, an advance plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

Evacuation and Shelter

There are six key components to a successful evacuation:

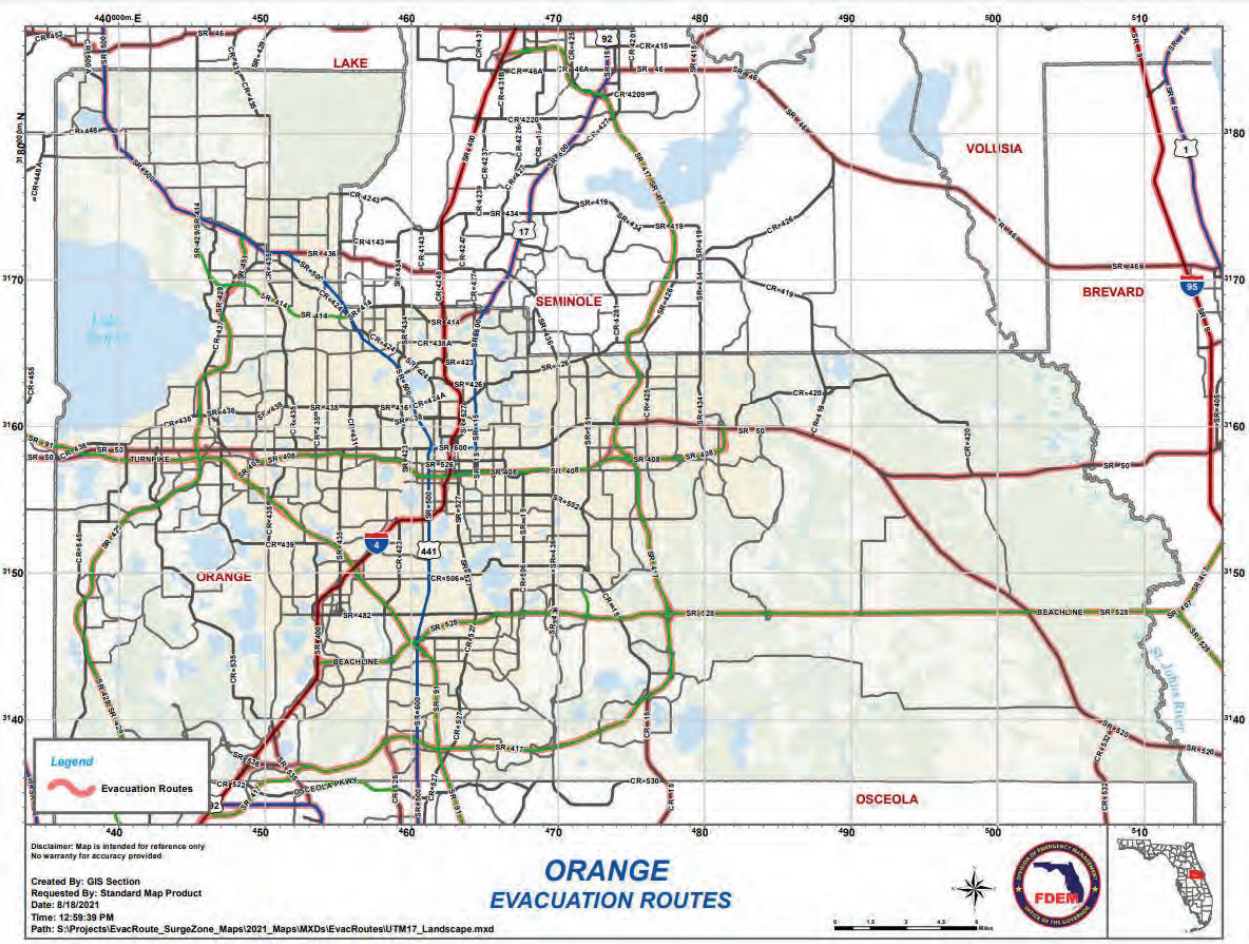
- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., the handicapped, prisoners, hospital patients, and schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

Orange County publicizes major evacuation routes, which are shown in Figure B.2 on the following page.

Orange County has six local shelters: Apopka High School, Corner Lake Middle School, Timber Creek High School, Odyssey Middle School, Bithlo Community Park, and Barnett Park. The park shelters are pet friendly.

Figure B.2 – Orange County Evacuation Routes



Source: https://www.floridadisaster.org/planprepare/disaster-preparedness-maps/

Post-Disaster Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus and other diseases
- Clearing streets
- Cleaning up debris and garbage

Following a disaster, there should be an effort to help prepare people and property for the next disaster. Such an effort would include:

- Public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work

- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Identifying other mitigation measures that can lessen the impact of the next disaster
- Acquiring substantially or repeatedly damaged properties from willing sellers
- Planning for long-term mitigation activities
- Applying for post-disaster mitigation funds

Regulating Reconstruction

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. There is a special requirement to do this in floodplains, regardless of the type of disaster or the cause of damage. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

Local Implementation and CRS Credit

The County bears the initial responsibility for warning the public of a threat, disaster response and recovery operations. As a corollary to this principal, each level within local government will accomplish the functions for which it is responsible, requesting relief from the next higher level of government only after resources at that level are inadequate to respond to the flood emergency or disaster. Requests for assistance will be made to the Florida Division of Emergency Management only after the Board of County Commissioners has declared a State of Local Emergency.

The National Weather Service (NWS) issues flash flood warnings and flood warnings. The NWS in Melbourne, Florida will issue flood advisory, watches and warning information to both the County and the citizens. The State Watch Office will follow-up the NWS' warning information with direct contact with the local Emergency Management Office.

Orange County's Office of Emergency Management administers/disseminates flood warning information. The County uses OC Alert, a reverse 9-11 calling system, to send special alerts and emergency notifications. The County also uses smartphone apps to both keep residents informed and collect information from residents on localized issues. The County's Public Warning Systems also include NOAA weather radio, media coordination, the Orange County website, partners such as 2-1-1, door-to-door notification by first responders, CodeRed, the Emergency Alert System, Orange County 3-1-1, Orange TV, Facebook, and Twitter.

Orange County currently receive credit for Activity 610 – Flood Warning Program. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits if there are additional measures, like telephone trees. Orange County receives credit for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities.

Conclusions

Orange County performs most emergency management functions and closely coordinates with the local communities on all emergency management functions. The County has significant capacity and methods for emergency warning and should continue to preemptively inform the public on the available emergency services.

Table B.4 – Emergency Services Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Emergency Services Measures Considered by FMPC			
-	Explore installing "Street May Flood" signs to critical locations	County has existing methods for reaching residents about road closures. County collects complaints on frequently flooded areas.	n/a
Emergency Services Measures and Funding Recommended for Implementation			
3	Ensure back up power systems and generators are in place for all critical facilities and emergency shelters.	The County's critical facilities and infrastructure will be less vulnerable to flood hazards.	Operating budget
6	Add flood gauges to improve calibration of current flood modeling system and enable better flood warning.	Adding flood gauges will improve threat recognition, enabling more accurate warnings to the public.	To be determined
16	Continue to implement stormwater management emergency hurricane preparedness procedures as needed and update regularly.	Taking these steps will ensure that all drainage systems are in good condition and that the County is prepared to handle and respond to a hurricane or tropical storm.	Operating budget

B.1.5 Structural Projects

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings
- Many projects can be built without disrupting citizens' homes and businesses
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

- Advantages
  - They may provide the greatest amount of protection for land area used
  - Because of land limitations, they may be the only practical solution in some circumstances
  - They can incorporate other benefits into structural project design, such as water supply and recreational uses
  - Regional detention may be more cost-efficient and effective than requiring numerous small detention basins
- Disadvantages
  - They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
  - They require regular maintenance
  - They are built to a certain flood protection level that can be exceeded by larger floods
  - They can create a false sense of security
  - They promote more intensive land use and development in the floodplain

Levees and Floodwalls

Probably the best-known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour.

Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Retention pond

Reservoirs can be dry and remain idle until a large rain event occurs, or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

Diversion

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

Local Implementation and CRS Credit

Orange County does not currently receive credit for Activity 530 – Flood Protection. Structural flood control projects that provide 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS in order to avoid duplicating the larger premium reduction provided by removing properties from the mapped floodplain.

The CRS credits smaller flood control projects. Any of the measures reviewed in this section would be recognized under Activity 530 - Flood Protection. Credits are based on the type of project, how many buildings are protected, and the level of flood protection provided.

Conclusions

There are many areas identified throughout Orange County that experience flooding due to overburdened channels and/or inadequate drainage systems. Structural improvements to stormwater management and drainage system can alleviate some flood risk in the County.

Table B.5 – Structural Projects Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Structural Project Measures Considered by FMPC			
-	Complete canal bank stabilization projects for Wheatberry Ct B-14 and Winter Park Pines Outfall.	Project already completed.	n/a
Structural Project Measures and Funding Recommended for Implementation			
5	Retrofit culverts along Apopka Boulevard.	Will address a specific, known stormwater flooding problem.	Operating budget
11	Acquire properties for a regional stormwater detention basin.	Will reduce the strain on surrounding stormwater infrastructure.	Operating budget
14	Improve/Upgrade pump stations at Bonnie Brook, Long Verona Park, and Woodsmere.	Will address specific, known stormwater flooding problems.	Operating budget
25	Complete stormwater retrofits on Control Structure for Pond 6612 and Lake George Outfall.	Will address specific, known stormwater flooding problems.	Operating budget

B.1.6 Public Information & Outreach

Outreach Projects

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Real Estate Disclosure

After a flood or other natural disaster, people often say they would have taken steps to protect themselves if they had known they had purchased a property exposed to a hazard. There are some federal and state requirements about such disclosures:

- Federal law: Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured.
- State law: State laws set standards for real estate sales and licensing of agents and brokers.

Libraries and Websites

Outreach activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources. Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

Technical Assistance

Hazard Information

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas, and zoning. When map information is provided, staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

Property Protection Assistance

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors
- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

Program for Public Information

A Program for Public Information (PPI) is an ongoing public information effort to design and transmit the messages that the community determines are most important to its flood safety and the protection of its floodplains' natural functions. A PPI document receives CRS credit and it is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program

- The outreach projects that will be done each year to reach the goals
- The process that will be followed to monitor and evaluate the projects

Local Implementation and CRS Credit

Orange County currently receives credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information. An update of the current PPI for Orange County is underway in conjunction with this FMP update. A community brochure is mailed to all properties in the SFAH, to repetitive loss areas, to Shaded X Zones, and to realtors, lenders, and insurance agents. Documents related to floodplain management are available in the public library. Credit is also provided for floodplain information displayed on the County's website.

Orange County also receives credit under Activity 360 – Flood Protection Assistance for providing site specific flood and flood related data to interested property owners and annually publicizing the service.

Additionally, the County participates in a variety of public outreach events for various hazards that could impact Orange County property and citizens, including holding an annual Hurricane Expo to provide information on risk, preparedness, and property protection options.

Special information programs have been established for people with special needs such as the elderly and individuals with disabilities. Once registered in the program, the Emergency Management Department will advise them of their vulnerability to flooding and items that they should bring to a shelter in the event of an evacuation and will also arrange for transportation to a shelter if needed.

Conclusion

Orange County has a public outreach program developed under the guidance of the FMPC. The County has a public information officer that can support outreach efforts. The County provides flood information through its website, news media, public meetings, and special events.

Table B.6 – Public Information and Outreach Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Public Information and Outreach Measures Considered by FMPC			
-	Continue to hold the Orange County Hurricane Expo to provide preparedness information to County residents.	Will be achieved through the development of a PPI.	n/a
-	Speak to Homeowners Associations about flood hazard preparedness and mitigation options.	Will be achieved through the development of a PPI.	n/a
-	Send outreach brochure to residents of the SFHA, Repetitive Loss Areas, and to HOAs.	Will be achieved through the development of a PPI.	n/a
Public Information and Outreach Measures and Funding Recommended for Implementation			
1	Encourage residents through outreach and education projects to consider the benefits of acquisition or elevation.	Repetitive loss properties are likely to continue incurring losses without mitigation. Acquisition and demolition is the only way to guarantee no future losses occur.	HMGP
23	Promote property protection measures for homeowners on the County website and social media pages.	Provide accessible information about ways to protect property	Operating budget

B.2 Mitigation Alternative Selection Criteria

The process for evaluating mitigation alternatives is described in Section 6.3. The following criteria were considered during the selection and prioritization of proposed mitigation measures:

STAPLEE

- Social: Will the measure have equitable outcomes? Does it benefit vulnerable populations?
- Technical: Will it work? Does it solve the problem? Is it feasible?
- Administrative: Does the community have the capacity to implement and manage project?
- Political: Is there public and stakeholder support? Is political leadership willing to support?
- Legal: Does the community have the authority to implement it? Are there liability implications?
- Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- Environmental: Does it comply with environmental regulations? Does it benefit or protect existing natural resources?

Sustainability Disaster Recovery

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection and enhancement
- Community participation

Smart Growth Principles

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design

Other

- Does measure address area with highest risk?
- Does measure protect…
    - The largest # of people exposed to risk?
    - The largest # of buildings?
    - The largest # of jobs?
    - The largest tax income?
    - The largest average annual loss potential?
    - The area most frequently impacted?
    - Critical infrastructure?
- When will funding be available?
- How visible is the project?
- Does the project have community credibility?

Appendix C. References

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