

Unit 7

Managing Floodplain Development: Additional Planning Considerations_____

Have a vision of your community's future.

Old Proverb

Overview

This unit discusses a number of additional matters that should be incorporated into the planning of a local floodplain management program. Communities should seriously consider enacting floodplain management regulations that exceed the minimum federal and state criteria addressed in the previous unit. The unit presents an overview of some of the more common approaches that can be employed for this purpose. A number of communities experience other types of flooding than that associated with the overflow of rivers or streams or coastal storms. Some management options for reducing flood losses in these special risk areas are outlined. Local support for floodplain management can often be gained by tying floodplain management for flood loss reduction with protection of the natural and beneficial resources and functions provided by relatively undisturbed floodplains. Local policies regarding the location of services and utilities have proven to be an effective measure to control inappropriate development. Some approaches that are being used by localities to minimize adverse effects on the environment are also discussed.

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References

Association of State Floodplain Managers, Inc.

- 1996 *Using Multi-Objective Management to Reduce Flood Losses in Your Watershed.*
Prepared for the U.S. Environmental Protection Agency. 73 pages, including
appendices.
- 1996 *Addressing Your Community’s Flood Problems: A Guide for Elected Officials.* Joint
Project with the Federal Interagency Floodplain Management Task Force. 40
pages.

Conservation Foundation

- 1980 *Coastal Environmental Management.* FIA-4. Washington, D.C.: U.S. Government
Printing Office. 161 pages.

Federal Emergency Management Agency

- 1987 *Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials.*
Prepared by the Association of State Floodplain Managers. FEMA 116.
- 1981 *Design Guidelines for Flood Damage Reduction.* FEMA 15.

Federal Interagency Floodplain Management Task Force

- 1996 *Protecting Floodplain Resources: A Guidebook for Communities.* Second Edition. 41
pages. FEMA 268.
- 1994 *A Unified National Program for Floodplain Management.* FEMA 248.

Florida, State of

- 1999 *Breaking the Cycle²: Strengthening Florida Before Disaster Strikes,* Florida
Department of Community Affairs
- 1999 *Building Disaster Resistant Communities: The Florida Showcase Project,* Department
of Community Affairs

- 1998 *Thinking Green: A Guide to the Benefits and Costs of Greenways and Trails*, Florida Department of Environmental Protection, Office of Greenways and Trails.
- 1997 *A Community Resource Guide for Greenway Projects*, Florida Department of Environmental Protection, Office of Greenways and Trails.
- 1995 *Creating a Statewide Greenways System*, Florida Greenways Commission Report to the Governor.

National Park Service

- 1996 *Floods, Floodplains and Folks. Rivers, Trails and Conservation Assistance Program*. 88 pages.

A. Introduction

Often local floodplain management regulations are adopted to meet minimum federal and state requirements. There are, however, a number of additional measures that the community should plan to use to supplement the floodplain management regulations incorporated into the local ordinance. Some of these additional measures can be incorporated into the local regulatory program. Others can be carried out as part of broader floodplain management measures to meet a number of additional community goals and objectives.

In managing floodplain development in the community, the emphasis of this course, local officials should carry out the following activities:

- Adopt and enforce floodplain management regulations that, at a minimum, meet requirements to participate in the NFIP and any more restrictive state standards.
- Enact more restrictive regulations in the local ordinance to meet particular community needs and circumstances that are not met by the minimum NFIP criteria.
- Adopt sound and workable approaches for management of “special” flood hazard areas, such as coastal erosion, flash flooding, areas below unsafe dams, etc., and where development controls are needed beyond those that can be employed in the local floodplain management ordinance.
- Tie the need to manage floodplains to reduce economic losses resulting from flooding with the need to protect and maintain the natural resources and functions of the community’s floodplains, which are often an undervalued community asset.

This unit discusses each of the above opportunities to plan and carry out additional floodplain management measures. By managing development in these areas, not only will flood losses be reduced, but a number of other community needs will be met, thus building the broad-based community interest and support needed for compliance with local regulatory controls.

Understanding the purpose and need for these additional measures can greatly aid those who have the responsibility for planning such measures and in carrying them out. As was the case in the previous unit concerning the provisions and purposes of the local floodplain management ordinance, this understanding is

NFIP Regulations and State/Local Standards

Any state or local floodplain management standard that is more restrictive than the minimum NFIP criteria is encouraged and shall take precedence [44 CFR §60.1(d)]

important in explaining the need for these additional measures to other local officials and the public. It is also equally important in adequately administering the various adopted measures.

The next section discusses the first of the three main topics of this unit, the enactment of floodplain management regulations that exceed the minimum federal and state criteria discussed in the previous unit.

B. More Restrictive Local Regulations

FEMA has established minimum floodplain management requirements for communities participating in the NFIP. State standards also apply.

However, communities should seriously consider enacting regulations that exceed the minimum state and federal criteria. In fact, the NFIP requires communities to at least consider additional measures that are found in 44 CFR §60.22, *Planning Considerations for Floodprone Areas*. They are reproduced in Table 7-1.

The following provides an overview of some of the more common approaches taken by communities in regulating floodplain development in a more restrictive manner. Many of these approaches may be eligible for credit under the Community Rating System (CRS), a program which provides insurance premium discounts to policyholders in communities with more restrictive floodplain management (see Unit 12).

Freeboard

**New
Term**

Freeboard

Freeboard is an additional height requirement above the BFE that serves as a margin of safety against extraordinary or unknown risks. This reduces the risk of flooding and makes the structure eligible for a lower flood insurance rate. *While not required by the NFIP standards, it is strongly recommended that communities adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a regulatory floodway and the requirements of 44 CFR §60.3(c)(10) where floodways are not identified.*

Some other reasons for considering a freeboard are that it:

- Accounts for future increases in flood stages if additional development occurs in the floodplain.
- Accounts for future flood increases due to upstream watershed development.

Table 7-1. Planning Considerations for Floodprone Areas (44 CFR §60.22)

1. *The floodplain management regulations adopted by a community for floodprone areas should:*
 - a) Permit only that development of floodprone areas which;
 - i) is appropriate in light of the probability of flood damage and the need to reduce flood losses
 - ii) is an acceptable social and economic use of the land in relation to the hazards involved; and
 - iii) does not increase the danger to human life;
 - b) Prohibit nonessential or improper installation of public utilities and public facilities in floodprone areas.
2. *In formulating community development goals after the occurrence of a flood disaster, each community shall consider:*
 - a) Preservation of the floodprone areas for open space purposes;
 - b) Relocation of occupants away from the most severely vulnerable floodprone areas (floodways, coastal high hazard areas);
 - c) Acquisition of land or land development rights for public purposes consistent with a policy of minimization of future property losses;
 - d) Acquisition of frequently flood-damaged structures or substantially flood-damaged structures.
3. *In formulating community development goals and in adopting floodplain management regulations, each community shall consider at least the following factors:*
 - a) Human safety;
 - b) Diversion of development to areas safe from flooding in light of the need to reduce flood damages and in light of the need to prevent environmentally incompatible floodplain use;
 - c) Full disclosure to all prospective and interested parties (including but not limited to purchasers and renters) that;
 - i) certain structures are located within floodprone areas;
 - ii) variances have been granted for certain structures located within floodprone areas; and
 - iii) premium rates applied to new structures built at elevations below the base flood substantially increase as the elevation decreases;
 - iv) the purchase of flood insurance is required as a condition of most mortgages for the purchase or construction of structures in the floodplain.
 - d) Adverse effects of floodplain development on existing development;
 - e) Encouragement of floodproofing to reduce flood damage;
 - f) Flood warning and emergency preparedness plans;
 - g) Provision for alternative vehicular access and escape routes when normal routes are blocked or destroyed by flooding;

Table 7-1. Planning Considerations for Floodprone Areas (44 CFR §60.22)

- h) For critical facilities already located in the floodprone area, establish minimum elevation, retrofitting, floodproofing of utilities and infrastructure, and access requirements to enable them to better withstand flood damage and to facilitate emergency operations. Critical facilities include schools, hospitals, nursing homes, day-care centers, orphanages, penal institutions, fire station, police stations, communications centers, water and sewage pumping stations, and other public or quasi-public facilities. New critical facilities should be prohibited from floodway and V Zones. If located in A Zones or the flood fringe, elevate to the 500-year level, provide access, etc.;
- i) Improvement of local drainage to control increased runoff that might increase the danger of flooding to other properties;
- j) Coordination of plans with neighboring community's floodplain management programs;
- k) The requirement that all new construction and substantial improvements in areas subject to subsidence be elevated above the base flood level equal to expected subsidence for at least a ten year period;
- l) For riverine areas, requiring subdividers to furnish delineations for floodways before approving a subdivision;
- m) Prohibition of any alteration or relocation of a watercourse, except as part of an overall drainage basin plan. In the event of an overall drainage basin plan, provide that the flood carrying capacity within the altered or relocated portion of the watercourse is maintained;
- n) Requirement of setbacks for new construction within Zones VI-30, VE, and V on a community's FIRM;
- o) Requirement of additional elevation above the base flood level for all new construction and substantial improvements within Zones AI-30, AE, VI-30, and VE on the community's FIRM to protect against such occurrences as wave wash and floating debris, to provide an added margin of safety against floods having a magnitude greater than the base flood, or to compensate for further urban development;
- p) Requirement of consistency between state, regional and local comprehensive plans and floodplain management programs;
- q) Requirement of pilings or columns rather than fill for the elevation of structures within floodprone areas, in order to maintain the storage capacity of the floodplain and to minimize the potential for negative impacts to sensitive ecological areas;
- r) Prohibition, within any floodway or coastal high hazard area, of manufacturing plants or facilities in which hazardous substances are manufactured;
- s) Requirement that a plan for evacuating residents of all manufactured home parks or subdivisions located within flood prone areas be developed and filed with and approved by appropriate community emergency management authorities.

- Acts as a hedge against backwater conditions caused by debris dams.
- Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations, and floodplain encroachments.
- Provides added measure of safety against flooding.
- Results in significantly lower flood insurance rates due to lower flood risk.

Freeboard safety factors are common in the design of flood control projects and floodplain development.

Many communities have incorporated freeboard requirements into the elevation and floodproofing requirements stipulated by the NFIP. Freeboard requirements adopted by these local communities range from six inches to four feet. However, based on a recent survey conducted by the national Association of State Floodplain Managers, the most common freeboard height is one foot, with one to two feet common in Florida. Offsetting the potential one-foot rise in the BFE from further floodplain development was the principal reason for this choice.



Buildings elevated above the flood level reduce flood insurance costs for current and future owners. Premiums are based on height above BFE. The additional expense to elevate a lowest floor an extra amount above the BFE is often more than offset within a few years by reduced flood insurance premiums.

More Restrictive Floodplain Encroachment and Floodway Standards

A common approach taken by many communities is to prohibit most development or particular structures in the identified floodway, regardless of whether or not an impact on flood heights would result by establishing standards that exceed the NFIP minimums.

Many communities have adopted provisions prohibiting the placement of mobile (manufactured) homes in the floodway. Others prohibit critical or hazardous facilities or uses. Some prohibit all structures.

While the NFIP floodway standard in 44 CFR §60.3(d) provides some protection, it does not specifically address the need to maintain flood storage. For this reason, communities wishing to limit any further

aggravation of the flooding condition should consider adopting more restrictive floodway standards and regulating the amount of fill or buildings that can displace floodwater in the flood fringe.

More restrictive state or local floodway standards provide increased opportunities to reduce flood losses as well as to protect natural and beneficial resources and functions of floodplains.

A regulatory approach taken by a watershed district in Minnesota was to enact regulations that restricted encroachments in the flood fringe to twenty percent of the total floodplain area. Likewise, a number of states have adopted more stringent floodway standards, ranging from zero to 0.5 feet of surcharge, and not the standard FEMA one-foot surcharge.

The result of these greater standards is to reduce the amount of floodplain area in which development (displacement) can occur. The protected floodway occupies most of the floodplain, leaving, at best, only narrow strips of developable flood fringe.

New Term

Compensatory storage

Another approach is to require **compensatory storage** to offset any loss of flood storage capacity. The developer is required to offset fill in the floodplain by excavating out additional floodable area to replace the lost flood storage area. This is accomplished by removing “bumps” in the floodplain or by lowering the grade along the edges to the same as that in the middle of the floodplain. Digging holes below that grade doesn’t help because they fill up with water from the groundwater table before they can provide effective floodwater storage.

The most direct and effective way to prevent storage loss is to prohibit fill within the floodplain. Whether this is an appropriate method will depend on the individual circumstances of the community.

Critical and Vulnerable Facilities

There are a number of activities and facilities for which even a slight chance of flooding would be too great. Certain types of activities and facilities should be given special consideration when formulating regulatory alternatives and floodplain management plans.

Activities necessary for emergency response must remain in operation and be accessible during flood events and, as such, should be discouraged from locating in floodprone areas. The activities include ambulance corps,

police, fire departments, hospitals, health clinics, emergency shelters, emergency management operations, and communication facilities.

Facilities housing vulnerable occupants also should be located elsewhere. Some examples include nursing homes, prisons and jails, centers and group homes for the mentally and physically handicapped, and day-care centers.

Important public utilities and facilities should be located outside of flood hazard areas or designed to higher regulatory standards. Such facilities include power generating plants and transfer stations, public water supply plants, solid waste incinerators and waste transfer stations, public libraries, museums, courthouses and other municipal buildings, and schools. Special care should be taken to protect irreplaceable public documents and records from flooding.

If floodplain location is necessary, higher regulatory standards and other precautionary measures, such as flood evacuation plans, freeboard, elevation above the 500-year floodplain, and elevated access ramps should be required. According to Executive Order 11988, federal agencies must meet rigorous alternative site evaluations and design standards before funding, leasing, or building **critical** facilities in the 500-year floodplain.

Hazardous facilities, such as liquid and gas fuel tanks, petrochemical facilities, chemical manufacturing and storage facilities, research laboratories testing infectious biological agents, explosive manufacturing and warehousing, toxic waste facilities, and landfills, can present significant environmental and public health problems caused by leaks, spills, or ruptures resulting from flood damage. Such facilities should be located in more suitable areas with less risk.

Better Designed and Constructed Foundations

It is important that local communities also consider implementing construction standards for elevated building foundations or for the placement of fill. Currently, standards are only required for floodproofed buildings and V Zones.

One option is to require certifications from registered professional engineers or architects certifying the adequacy of elevated building foundations and the proper placement, compaction, and protection of fill when it is used in building elevation. The drawback to this approach is the

increased cost to property owners and whether it is justified given the flooding conditions of a community.

Often, for most situations, building codes adequately address concerns

Better Designed and Constructed Foundations

- Require certifications from registered professional engineers or architects certifying adequacy of elevated buildings
- Require a specific construction standard

about elevated building foundations and the proper placement, compaction, and protection of fill. This is the case throughout Florida, because of the state building code.

An alternative is to require a specific construction standard, such as the V Zone standard for the elevation



of structures in coastal AE and AH Zones, and to allow alternative engineered designs, provided the necessary documentation is submitted to the community. Coastal AE Zones are of particular concern since they are subject to wave actions of up to three feet in height. The NFIP Zone AE construction standards do not yet address this situation.

Prohibiting Development or Structures in the Floodplain

Prohibiting Floodway Structures

- Manufactured homes
- Critical or hazardous facilities
- Residential structures

Some communities prohibit some or all development in floodplain areas. While regulatory standards, including the prohibition of floodplain development, may prove to be legal and proper, whether this approach is desirable or practical is another question.

A common approach taken by many communities is to prohibit most development or particular structures in the identified floodway, regardless of whether or not an impact on flood heights would result. Stopping development along a narrow floodplain in a stream valley susceptible to destructive flash flooding may be the appropriate circumstance for this kind of action.

Prohibition may also be a better option in rural areas where large tracts of agricultural land exist and the effect on property owners would be minimal. However, in urban areas, development rights may be transferred out of the floodplain area to safer areas, with a density bonus as an incentive.

The prohibition of floodplain development in the form of a rebuilding moratorium has been used by a number of communities following flood disasters. Often temporary measures are put in place after a flood to allow

time for the preparation of relocation actions, the installation of flood control projects, or the formulation of comprehensive redevelopment or floodplain management plans. Some communities that have instituted moratoria after flood events are Larimer County, Colorado; San Bernardino and Lake Elsinore, California; and Cowlitz County, Washington. Los Angeles County, California, is perhaps the most widely known community to have exercised this approach.

The natural functions and values of floodplains coupled with their hazardous nature have led communities to promote and guide the less intensive use and development of floodplains. More and more municipalities are requiring that important natural attributes such as wetlands, drainage ways, and floodplain areas be set aside as open space as a condition to approving subdivision proposals.

Many counties have enacted low-density zoning in floodplains to reduce the number of new structures. Others are using density bonuses to steer development to the most suitable sites and to leave floodplains, wetlands, and other open space resources undeveloped. Comprehensive land use planning appears to be on the increase and growth management approaches to protecting and preserving floodplains should become more popular in this decade and beyond. Many states, including Oregon, New Hampshire, and Hawaii have mandatory local laws that use planning programs that include floodplain requirements.

Setbacks

Another approach is to use setbacks to keep development out of harm's way. Setback standards establish minimum distances that structures must be set back from river channels and coastal shorelines. Setbacks can be defined by vertical height as well as horizontal distances.

For coastal shorelines, setback distances act as buffer zones against beach erosion. A number of states, including Florida, South Carolina, North Carolina, New York, Maryland, and Connecticut, have adopted coastal setbacks. Many setbacks are based on the average annual erosion rate. Florida's Coastal Construction Control Line rules address setback distances. These were discussed in Unit 6, Section D and pertain to excavation or construction of structures seaward of the construction control line or the 50-foot setback pursuant to state law.



Setbacks also have been used in riverine situations. Such setbacks are frequently created to serve as isolation distances to protect water quality

Setbacks

- Twelve states have adopted coastal setbacks
- Can be defined by vertical height as well as horizontal distances
- Can be used in riverine situations
- Frequently serves as isolation distances to protect water quality and stream and wetland resources

and stream and wetland resources. On streams and rivers without a designated floodway, the Florida NFIP coordinating agency and FEMA regional office recommend a setback equal to five times the bank-to-bank width of the watercourse (a maximum of 500 feet on large rivers).

Setbacks from watercourses have been used to minimize the effect of non-point sources of pollution caused by land development activities, timber harvesting, and agricultural activities. Solid waste landfills and on-site sewage disposal systems often are restricted within certain distances of a body of water.

Dry Land Access

Fire prevention, evacuation, and rescue operations are common emergency response activities associated with flood disasters. The

Dry Land Access

To ensure that emergency equipment can operate during floods, some communities have enacted ordinances requiring that all roads and access facilities be elevated above the BFE

effectiveness and success of these efforts greatly depend on readily available access. However, streets and roads are usually the first things to be inundated in the event of a flood. To ensure access, some communities have enacted ordinance provisions requiring that all roads and other access facilities be elevated to or above BFE.

While some local officials may feel that this approach is too restrictive, it is important to note that emergency response personnel die every year attempting to rescue flood-stranded citizens. Also, others may die or be seriously injured because they cannot be rescued in time.

Stormwater Management

One of the most common local programs that is adopted above and beyond minimum NFIP standards is stormwater management. One of the goals of stormwater management is to reduce the extra volume of runoff in an urbanizing watershed. Stormwater retention and detention ponds, drainage systems, and limitations on the amount of impervious surfaces

(paving and roofs) are typical components of these programs. Usually extra runoff is not eliminated, just reduced. So, as a watershed urbanizes, BFEs will still increase downstream, but not as much.

C. Location of Services and Utilities

In addition to the use of regulatory methods to control development in floodplains (covered in Unit 6), local governments may establish programs, policies, and directives that discourage inappropriate uses of the floodplain. Typically these types of policies require the local governing body to take action rather than impose requirements on private property owners. One such effective action that may be undertaken involves the location of services and utilities.

The design of services and utilities can have both direct and indirect impacts on future floodplain development and flood losses. If roads, bridges, sewer and water lines, and other utilities are constructed in floodprone areas, these services and utilities may be vulnerable to flood damage. In addition to directly suffering flood losses, services and utilities located in or through floodprone areas can indirectly lead to more intense use of the floodplain. For example, placement of a sanitary sewer line in a floodplain may create additional pressure on local authorities to allow development on the floodplain and connection to the sewer line. On the other hand, little development is likely to take place if the locality has an official policy prohibiting the extension of services and utilities into floodprone areas or denying hookups for new development in these areas.

Please complete Learning Check # 1 before proceeding.



D. Management of Flood Hazards of Special Concern

Flooding is commonly associated with the overflow of rivers or streams onto the adjacent floodplain or by coastal storms. However, as discussed in Unit 1, there are other types of floods and floodplains. These often involve destructive and high-risk situations and create flood hazards of special concern. In some instances, high-risk flood areas are not identified or required to be regulated through the NFIP. For example, dam break inundation areas are not shown on the FIRMs.

A special hazard could be any of the following:

- Areas behind or below inadequate dams and levees.
- Coastal flooding and erosion.
- Flash flooding.
- Fluctuating lake levels.

Depending on location, a community might experience one or more of these special hazards. Table 7-2 outlines some possible management options.

For additional information about these flood hazards and how to reduce losses, refer to *Reducing Losses in High Risk Flood Hazard Areas*, FEMA-116 (1987).

E. Environmental Protection Measures

It is often difficult to obtain the public and political support needed to plan and carry out local floodplain management measures designed solely to reduce future flood losses. Flooding may not occur often enough to be viewed as a local problem in need of a solution.

Support can often be gained by associating floodplain management for flood loss reduction with other broader community concerns, needs and goals. This can build a broader-based constituency for managing the community's floodplains and wetlands if other interests realize that their needs can also be met through their involvement and support. This, in turn, brings more resources and expertise into play. Then too, designing and packaging of funding proposals to meet a

Related Environmental Regulations

- Wetland protection
- Rare and endangered species
- On-site sewage disposal
- Facilities siting
- Non-point source pollution control
- Point source pollution control
- Special designations

Table 7-2. Reducing Flood Losses in Special Risk Areas			
Hazard	Special Risk Factors	Area of Occurrence	Management Options
Areas Behind Unsafe or Inadequate Levees	<ul style="list-style-type: none"> - Water depths - Velocity - Duration - Suddenness 	Riverine areas throughout the country	<ul style="list-style-type: none"> - Identify and map levees and assess their adequacy. - Define inundation zones for areas behind unsafe or inadequate levees and interior drainage systems. - Require periodic inspection and maintenance of levees. - Adopt building standards based on risk of breaching or overtopping. - Require pump systems and other methods for dealing with internal drainage behind levees. - Install or require installation of warning systems and evacuation plans for areas protected by unsafe or inadequate levees.
Areas Below Unsafe or Inadequate Dams	<ul style="list-style-type: none"> - Water depths - Velocity - Suddenness - Debris in water 	Riverine areas throughout the country	<ul style="list-style-type: none"> - Coordinate floodplain management and dam safety programs. - Identify and map dams and assess their adequacy. - Identify dam break inundation zones for inadequate or unsafe dams; determine flood heights; map floodway and flood fringe. - Abate or require abatement of unsafe or inadequate dams. - Restrict new development below unsafe or inadequate dams. - Require dam owners to prepare dam inspection schedules and maintenance plans; meet yearly with dam owners to review these schedules or plans. - Prepare or require dam owners to prepare warning systems and evacuation plans for areas below unsafe or inadequate dams. - Manage reservoirs to optimize flood hazard reduction.

Hazard	Special Risk Factors	Area of Occurrence	Management Options
Coastal Flooding and Erosion	<ul style="list-style-type: none"> - Structural damage as buildings are undermined - Potential rapid land erosion from storms - Complete destruction of land (in some instances) 	Barrier islands, bluff areas (Great Lakes, West Coast), beaches	<ul style="list-style-type: none"> - Gather existing erosion studies and historic data and prepare general or specific maps based upon these or other data. - Adopt setback lines to prohibit development on erosion-prone land and on protective land features such as dunes. - Adopt building performance standards pertaining to depth and specifications for pilings, groins, seawalls, use of septic tanks, and surface drainage. - Acquire undeveloped coastline and relocate structures. - Rebuild beaches and dunes.
Flash Flooding	<ul style="list-style-type: none"> - Rapid increase in water depths - Suddenness - Velocity - Debris (often) 	Urbanizing areas where water runoff is rapid, or standing water because aquifer is full or drainage is not adequate or is blocked by debris	<ul style="list-style-type: none"> - Collect historical data on flash flooding and use it and engineering studies to map flash flood inundation areas. - Prohibit development and other activities (e.g., campgrounds) in high-risk areas. - Require that new development in other areas be constructed consistent with water velocities and potential debris load. - Install or require developers to prepare warning systems, prepare and implement evacuation plans. - Require that subdividers install onsite flood detention and design drainage systems to reduce flash flood potential. - Mark areas. - Construct reservoirs and other devices to reduce flash floods.

Hazard	Special Risk Factors	Area of Occurrence	Management Options
Long-Term Fluctuation in Lake Levels	<ul style="list-style-type: none"> - Long duration - Waves and ice - Lake quality degradation as flooded sewage systems fail - Ground water quality degradation as flooded wells act as conduit to transfer lake water to aquifers 	Primarily with water elevations dependent upon ground water levels; lakes without outlets	<ul style="list-style-type: none"> - Map the historical bed of the lake. - Adopt floodplain, shoreland, and wetland ordinances to control development in such areas. - Require elevation of structures and public utilities on fill or pilings. - Prohibit septic and water systems in flood areas if development is allowed to occur. - Adopt setback lines or extra freeboard to reduce damage from waves and ice damage to structures if development is to occur. - Acquire floodprone lands and relocate threatened structures. Install pumps and other engineering works to reduce or stabilize lake levels.

number of community goals can greatly enhance the likelihood of success in obtaining outside resources.

One such approach is to tie the need to manage floodplains to protect the economic well-being of the community with the need to protect and maintain the natural resources and functions floodplain areas possess. These resources and functions can be of considerable, often unrealized or underestimated, benefit to the community.

There is general agreement among floodplain management professionals that the natural and cultural resources of floodplains are not being adequately protected.

Two basic approaches for protection of floodplain natural resources are preservation and restoration. Preservation strategies focus on strict control or prohibition of development in sensitive or highly hazardous areas (e.g., through establishment of wildlife sanctuaries), while restoration strategies focus on actions to improve the quality or functioning of degraded floodplains (e.g., by restoring damaged wetlands). It is not always possible to make a clear distinction between the two strategies.

Preservation and restoration of floodplain natural resources are often accomplished, either directly or indirectly, through a wide variety of development controls or by means of regulatory standards designed to protect valuable natural resources or minimize adverse impacts on those resources.

These regulatory standards and development controls are directed toward inland and coastal wetlands, estuarine and coastal areas, barrier beaches and sand dunes, rare and endangered species, riverine and coastal fisheries, and wild and scenic rivers.

Unit 1 contained a discussion and summary (Table 1-2) of the strategies and tools that can be used to preserve and protect floodplain natural and cultural resources. The available tools include:

- Floodplain, wetland, and coastal barrier regulations.
- Transfer of development rights.
- Development and redevelopment policies.
- Information and education.

- Tax adjustments.
- Administrative measures.

Regulatory measures are among the most widely used and most effective means of protecting natural and cultural resources of floodplains, and are used by all levels of government. Federal regulations and those in many states protect several types of natural and cultural floodplain resources by limiting the ways, location, and extent to which these resources may be modified.

When a federal agency proposes to fund a project located in a flood hazard area, the National Environmental Policy Act (NEPA) enacted in 1970 requires an evaluation of the project's environmental impact as part of the decision-making process. Also Executive Order 11988 requires documentation that there is no feasible alternative to location in the floodplain and identification of what flood damage reduction measures will be undertaken.

The major regulatory tool at the federal level for managing floodplain natural resources is the Section 404 regulatory program established by the Clean Water Act. Jointly administered by the Corps of Engineers and the U.S. Environmental Protection Agency (EPA), the Section 404 program regulates the discharge of dredged or fill material into the waters of the United States, including adjacent wetlands.

The Section 404(b)(1) guidelines provide extensive environmental criteria for judging permit applications and emphasizing the need to prevent avoidable losses of aquatic resources, as well as the need to minimize adverse environmental impacts.

Other environmental factors that must be considered in an effective floodplain management program are discussed below including wetland protection, rare and endangered species, on-site sewage disposal, facilities siting, pollution control, and special designations.

The following paragraphs also discuss some approaches that are being used by state and local jurisdictions to minimize adverse effects on the environment.

Wetland Protection

In many instances wetlands and floodplains are synonymous, i.e., most non-tidal wetlands are found in floodplains. Wetlands contribute to many of the natural resources of floodplains and to the natural functions they serve. These are listed in Table 1-2.

When wetlands are destroyed or significantly impaired, nature's best protection against flooding is destroyed with them; wetlands naturally spread and absorb heavy rains and fast-flowing floodwaters, holding the water and releasing it slowly. This reduces the worst effects of storms and keeps nearby rivers and streams stable.

Wetlands also provide many water-quality benefits and attract wildlife. They remove sediment, nutrients and other pollutants from water before they reach streams and inlets. Studies show that wetlands can remove nearly 90 percent of the sediment and 50 percent of the nutrients from agricultural runoff. Many animals, including most fish and shellfish, depend on wetlands sometime during their life cycles. Local and migratory waterfowl also depend on wetlands for food, shelter, breeding, and wintering grounds.

For these and other reasons, all coastal states and many inland states regulate wetlands. The coastal regulatory programs of some states outline minimal criteria for permit issuance, whereas other states consider the cumulative impacts of development during the permit review process. Inland wetlands generally receive less protection than coastal wetlands.

Local regulations, including zoning and subdivision regulations, building codes, housing codes, sanitary and well codes, and other regulations may directly or indirectly address management of floodplain natural resources. Many local zoning and subdivision regulations establish requirements related to protection of floodplain natural resources. These provisions include: specified distances that buildings must be set back from the shore, density limitations in shoreland areas, restrictions or prohibitions on certain kinds of development in highly sensitive areas, and specification of uses compatible with natural resources protection.

The desire to reduce the cumulative impacts of wetland losses has led many jurisdictions to adopt a "no net loss of wetlands" policy. No net loss is addressed either in terms of acreage or the functional value of the

wetlands. Despite these programs and other such efforts, over 300,000 acres of wetlands are lost, nationally, each year, mostly in floodplains.

Rare and Endangered Species

Undeveloped floodplains can contain habitat for rare and endangered plant and animal species. Many states have programs to identify such species and to acquire or regulate tracts that contain them. On the federal level, the Endangered Species Act of 1973 directs federal agencies not to undertake or assist projects that would adversely affect species listed as endangered.

On-Site Sewage Disposal



Most states and communities regulate the design, location, and placement of on-site sewage systems. Because the objective of such programs is to prevent surface and subsurface contamination, there are many limiting factors in selecting a proper site and in designing an appropriate system. Areas with the following characteristics are less than desirable for the placement of on-site systems: high groundwater tables, impervious soils, certain types of porous soils, and potential for flooding. In Florida, a septic system is usually prohibited below the 10-year flood elevation and within the 10-year floodplain.

In many instances, especially in rural areas, the inability of the property owner to obtain a sewage permit precludes building in the floodplain.

Facilities Siting

There are stringent governmental regulations regarding the siting of critical facilities, such as hazardous waste facilities, nuclear power plants, hospitals, and police and fire stations when they are located in a floodplain area. States and communities also may have siting regulations that discourage or prevent dangerous or hazardous development in floodplain areas. These include storage of hazardous materials, sanitary landfills, and related activities.

Non-Point Source Pollution Control

States, conservation districts, or communities may have soil erosion and sedimentation regulations in effect to curb soil displacement when a site is under development. Buffer zones or stream setbacks may apply to on-lot

disposal systems, timber harvesting, tilling of soil, mining, or to development in general, to protect stream quality, especially those streams of exceptional value. These requirements are often part of, or complement stormwater management regulations.

Point Source Pollution Control

Since the enactment of the Clean Water Act and related state legislation, more care is being given to the regulation of direct discharges into waterways. The water quality of many rivers and streams has improved as a result, and the diversity and health of fish and wildlife habitats is improving as well.

Special Designations

Often stream corridors have been determined to possess special value or importance to an area, region, or state. These corridors are given special designations and afford an extra level of recognition and protection.

In Florida, a 7.6-mile segment of the Loxahatchee River in Palm Beach County has been given a federal wild, scenic and recreational designation. Wild and scenic river programs at the federal and state levels are examples of programs designed to encourage and promote their protection. While such programs are not necessarily regulatory in nature, they do encourage proper planning and land use control, discourage unwanted development, and guide federal and state actions, accordingly.

In Florida, a number of water bodies have been designated as Outstanding Florida Waters. The statutory requirement for an Outstanding Florida Water designation is that the water body must have “natural attributes worthy of special protection” (Section 403.061(28), Florida Statutes). Outstanding Florida Waters include waters within national and state parks, wild and scenic rivers, wildlife refuges, aquatic preserves, seashores, marine sanctuaries, estuarine research preserves, certain national monuments, and certain waters in national forests, as well as waters in the state park system, wilderness areas, and waters in areas acquired through donation, trade, or purchase under the Environmental Lands Bond Program, Conservation and Recreation Lands Program, Land Acquisition Trust Fund Program, and Save Our Coast Program. Almost



350 water bodies in these areas have been designated as Outstanding Florida Waters.

Waters outside these areas also may be designated Outstanding Florida Waters under the classification Special Waters. Special Waters are those determined, through a process outlined in Chapter 17-3.041 (2), Florida Administrative Code, to be of exceptional recreational and ecological significance. As of June 1999, 39 of Florida's 1,700 rivers, plus several lakes and lake chains, several estuarine areas, and the Florida Keys have been designated Special Waters within the Outstanding Florida Waters designation.

A map showing the general location of Outstanding Florida Waters is shown in Figure 7-1.



Please complete Learning Check # 2 before proceeding.

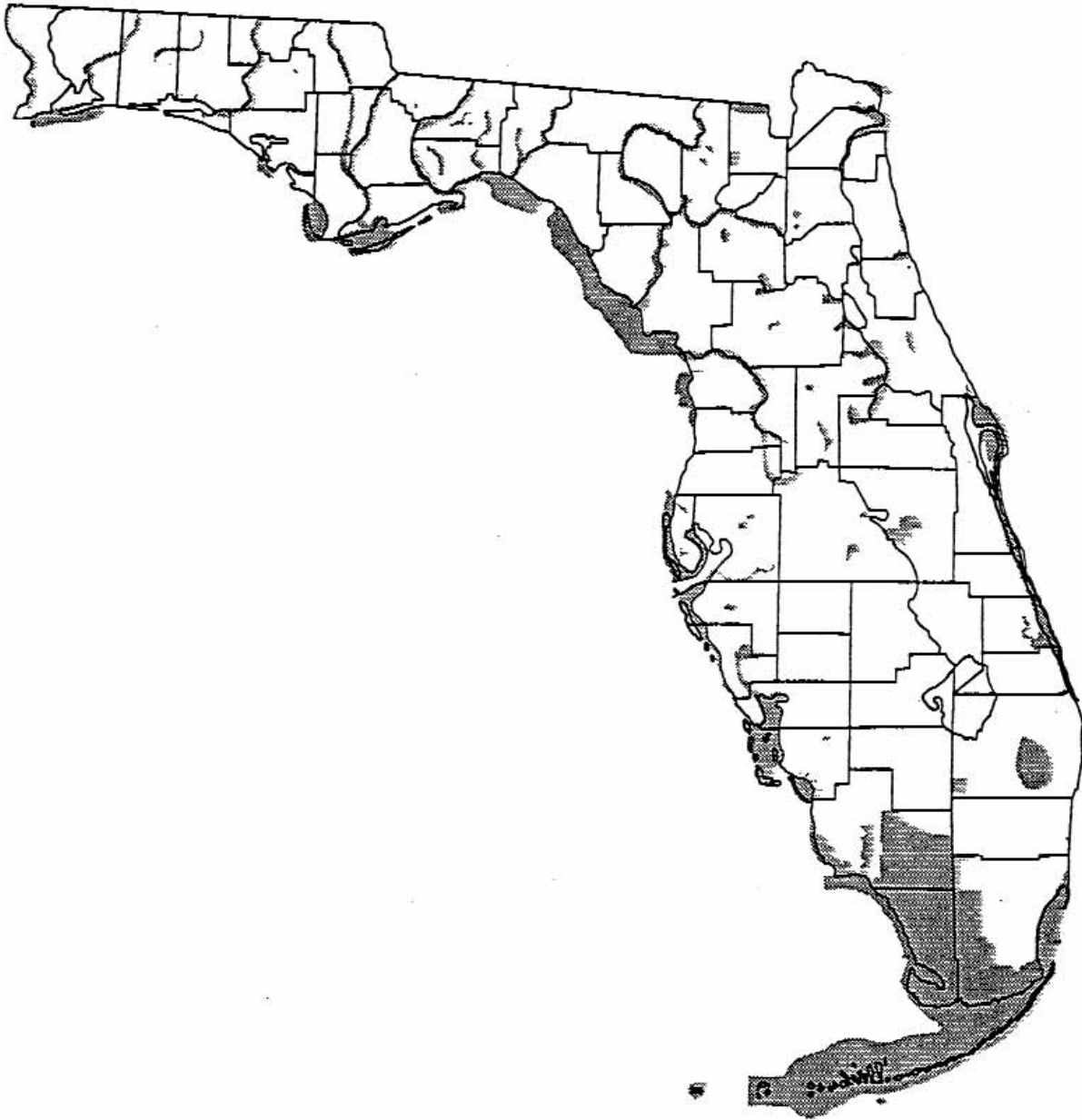


Figure 7-1. General Location of Outstanding Florida Waters
(shown as shaded areas)



Learning Check # 2

Purpose: To check understanding of management options for flood hazards of special concern and environmental protection measures.

Directions: Answer the following questions.

1. Which of the flood hazards of special concern discussed earlier in this unit occur in your community?

2. For each of these. What management measures does your community employ?

Hazard

Measures

3. List at least three environmental factors that should be considered in a local floodplain management program.

4. Why is it important to tie the need to manage floodplains to protect the economic well being of the community with the need to protect and maintain the natural resources and functions that floodplain areas possess?

Answers to Learning Checks

Answers to Learning Check # 1

1. List three ways that a community can require stricter NFIP requirements.

You could list any of the following:

- a) **Require freeboard**
- b) **Elevated buildings**
- c) **More restrictive floodplain encroachment and floodway standards**
- d) **Siting of critical and vulnerable facilities**
- e) **Better designed and constructed foundations**
- f) **Prohibit structures in the floodway**
- g) **Prohibit development or building structures in the floodplain**
- h) **Setbacks**
- i) **Ensure dry land access during floods by enacting ordinances for higher elevations for roads and access facilities**

Answers to Learning Check # 2

1. Which of the flood hazards of special concern discussed earlier in this unit occur in your community?

This depends on the community. Those listed should include the ones from the list at the start of Section D, “Management of Flood Hazards of Special Concern.”

2. For each of these. What management measures does your community employ?

Hazard

Measures

Again community specific. Compare to those listed in Table 7-2.

3. List at least three environmental factors that should be considered in a local floodplain management program.

Wetland protection, protection of rare and endangered species, on-site sewage disposal, hazardous materials facilities, pollution control

4. Why is it important to tie the need to manage floodplains to protect the economic well being of the community with the need to protect and maintain the natural resources and functions that floodplain areas possess?

This can build broader-based community support for, and involvement in floodplain management; bring more resources and expertise to bear; and increasing the likelihood of obtaining outside resources (technical and financial assistance).