

## C. HIGHER REGULATORY STANDARDS

FEMA has established minimum floodplain management requirements for communities participating in the NFIP. Communities must also enforce more restrictive State requirements. 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 which are found in 44 CFR 60.22, Planning Considerations for Floodprone Areas. They are summarized in Figure 6-2.

- (a) The floodplain management regulations adopted by a community for floodprone areas should:
  - (1) Permit only that development of floodprone areas which
    - (i) is appropriate in light of the probability of flood damage
    - (ii) is an acceptable social and economic use of the land in relation to the hazards involved
    - (iii) does not increase the danger to human life
  - (2) Prohibit nonessential or improper installation of public utilities and public facilities.
- (b) In formulating community development goals after a flood, each community shall consider:
  - (1) Preservation of the floodprone areas for open space purposes
  - (2) Relocation of occupants away from floodprone areas
  - (3) Acquisition of land or land development rights for public purposes
  - (4) Acquisition of frequently flood-damaged structures.
- (c) In formulating community development goals and in adopting floodplain management regulations, each community shall consider at least the following factors:
  - (1) Human safety
  - (2) Diversion of development to areas safe from flooding
  - (3) Full disclosure to all prospective and interested parties
  - (4) Adverse effects of floodplain development on existing development
  - (5) Encouragement of floodproofing to reduce flood damage
  - (6) Flood warning and emergency preparedness plans
  - (7) Provision for alternative vehicular access and escape routes
  - (8) Minimum retrofitting requirements for critical facilities
  - (9) Improvement of local drainage to control increased runoff
  - (10) Coordination of plans with neighboring community's floodplain management programs
  - (11) Requirements for new construction in areas subject to subsidence
  - (12) Requiring subdividers to furnish delineations for floodways
  - (13) Prohibition of any alteration or relocation of a watercourse
  - (14) Requirement of setbacks for new construction within V Zones
  - (15) Freeboard requirements
  - (16) Requirement of consistency between state, regional and local comprehensive plans
  - (17) Requirement of pilings or columns rather than fill to maintain storage capacity
  - (18) Prohibition of manufacturing plants or facilities with hazardous substances
  - (19) Requirements for evacuation plans

**Figure 6-2: NFIP planning considerations (44 CFR 60.22)**

Some of the more common approaches taken by communities to better regulate floodplain development are explained in this section.

## **LOCATION RESTRICTIONS**

Where the hazard is so severe that certain types of development should be prohibited, a location restriction provision may be appropriate. Some communities prohibit some or all development in all or parts of their floodplains. A common approach is to prohibit particular structures in the floodway or areas exceeding certain flood depths or velocities.

Because this is the most restrictive higher regulatory provision, location restriction language has to be drafted carefully to avoid a taking challenge. Sometimes, a community can tie transfers of development rights or other benefits to a development that avoids the flood hazard area. These types of “win – win” situations benefit everyone and reduce the potential for challenging the ordinance.

### **Highly hazardous areas**

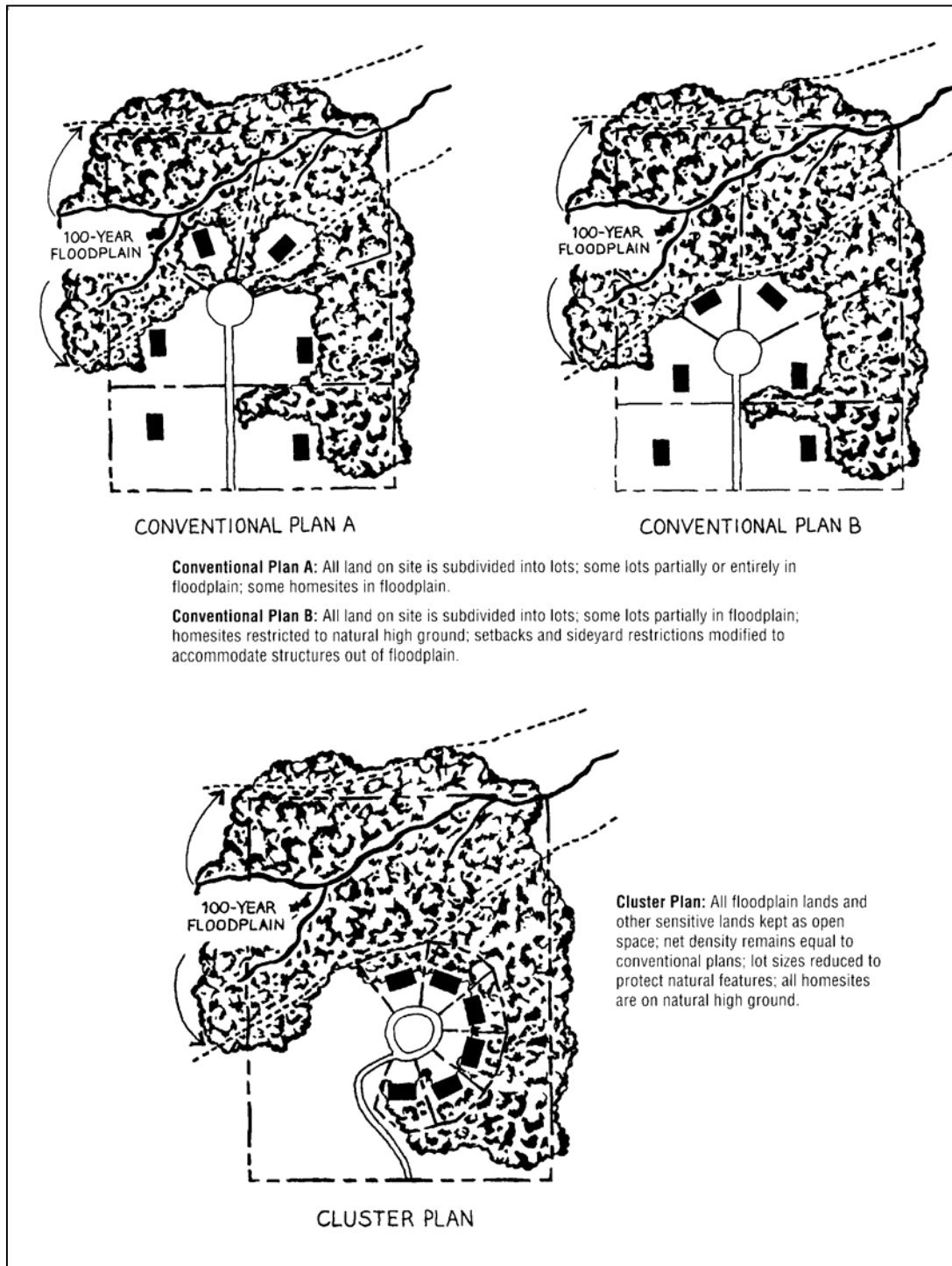
Prohibiting development makes sense in high hazard areas, where people are exposed to a life-threatening situation even though buildings could be protected from flood damage. For example, it would be appropriate to prohibit development at the apex of an alluvial fan or along a narrow floodplain in a stream valley that is susceptible to flash flooding.

### **Subdivision design**

Undeveloped land, still in large tracts, offers the best opportunity to limit where certain types of development will be located. When a developer wants to subdivide the land, communities have many tools to arrange the development so that buildings are kept out of the floodplain or at least the building sites are located in the least hazardous areas of the floodplain. This has two advantages over simply requiring the buildings to be protected from flooding:

- ◆ Buildings aren't isolated by floodwaters, putting a strain on local emergency services to guard them or evacuate or rescue their occupants, and
- ◆ The neighborhood will have waterfront open space and recreation areas – a valuable amenity in most communities.

A housing development can be clustered, as shown in Figure 6-3, so the developer can sell the same number of home sites as a conventional subdivision. Check your state laws on whether cluster development can be mandated or just encouraged during the subdivision review process.



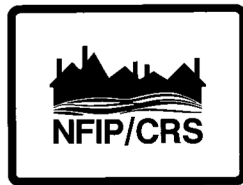
**Figure 6-3. Clustering can keep buildings out of smaller floodplains**

*(Source: Subdivision Design in Flood Hazard Areas)*

As explained in pages 17-25 of the American Planning Association's *Subdivision Design in Flood Hazard Areas*, the planner's toolbox contains other tools for encouraging developers to avoid floodplains. A density transfer can be used to, say, trade development rights with a flood-free site. Credits or bonuses can be given to increase the allowable density if the developer puts building sites on high ground or does not disturb a wetland.

The planned unit development (PUD) approach offers developers flexibility in planning the entire area. For example, a PUD may have a cluster development with houses closer together than allowed under normal zoning lot line setbacks.

Subdivision and planning regulations also can mandate that a certain portion of a development be set aside as open space for recreation or stormwater management purposes. Developers find that it is cheaper to put the open space in the floodplain than to put buildings there that have to incorporate the more expensive floodplain requirements. Linear parks and greenways that connect the open space areas through a community are becoming more and more popular and help sell new developments.



The Community Rating System credits land development criteria that discourage development in floodplains under Activity 430LD in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

## Setbacks

Setbacks may be used to keep development out of harm's way while at the same time achieving other community purposes. Setback standards establish minimum distances that structures must be positioned—set back—from river channels and coastal shorelines. Setbacks can be defined by vertical heights or horizontal distances.

While floodplain boundaries are defined by vertical measures, horizontal setbacks also provide protection from flood damage, especially in coastal areas where the effects of waves decrease further inland.

For coastal shorelines, setback distances act as buffer zones against beach erosion. In riverine situations, setbacks prevent disruption to the channel banks and protect riparian habitat. Such setbacks are frequently created to serve as isolation distances to protect water quality, and stream and wetland resources.

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.



The Community Rating System credits setbacks that prevent disruption to shorelines, stream channels and their banks under Activity 430, Section 431.g.2 in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

## Manufactured homes

Many communities have adopted provisions prohibiting the placement of manufactured (mobile) homes in the floodway. Check your ordinance. This used to be a minimum requirement of the NFIP and may still be on your books.

## Natural areas

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.



The Community Rating System provides substantial credit for preserving floodplain areas as open space. If buildings and filling are prohibited, credit is found under Activity 420 Open Space Preservation, Section 421.a in the *CRS Coordinator's Manual* and the *CRS Application*. If the area has been kept in or restored to its natural state, more credit is provided under Section 421.c.

## Low-density zoning

When a community prepares its land use plan and zoning ordinance, it should consider what uses and densities are appropriate for floodplains. If buildings are not prohibited entirely, the community should zone its floodplains for agricultural or other low-density use to reduce the number of new structures.

For example, it's better to have a floodplain zoned for agricultural or conservation use with a minimum lot size of 20 or 40 acres than to allow four single-family homes to every acre. In some areas, "residential estate" zones with minimum lot sizes of two to five acres provide lots large enough that homes can be built out of the floodplain.

Some states have land use planning laws that require local plans before enacting a zoning ordinance. Some—including Oregon, Florida, New Hampshire and Hawaii—mandate that local plans account for floods and other natural hazards.



The Community Rating System provides substantial credit for zoning floodplains with low-density uses under Activity 430LZ Low Density Zoning in the *CRS Coordinator's Manual* and the *CRS Application*.

## BUILDING REQUIREMENTS

### Freeboard

Freeboard is an additional height requirement above the base flood elevation (BFE) that provides 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, your community is encouraged to 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 encroachment requirements where floodways are not identified.

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.
- ◆ Acts as a hedge against backwater conditions caused by ice jams and debris dams.
- ◆ Reflects uncertainties inherent in flood hazard modeling, topography, mapping limitations and floodplain encroachments.
- ◆ Provides an 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 communities range from six inches to four feet.

When constructing a new elevated building, the additional cost of going up another foot or two is usually negligible. Elevating buildings above the flood level also reduces flood insurance costs for current and future owners.

Figure 9-3 shows the insurance rates for a post-FIRM single-family dwelling. Note that the higher the building is above the BFE, the lower the rate. These rates are based on the true or actuarial cost of insuring a building in the floodplain. By adding one foot of freeboard above the BFE, the cost for the first layer of coverage is reduced from 45 cents per \$100 of coverage to 26 cents. This shows how the extra foot reduces the potential for flood damage.



The Community Rating System credits freeboard under Activity 430, Section 431.a in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

## Foundation standards

Without a safe and sound foundation, an elevated building can suffer damage from a flood due to erosion, scour or settling. The NFIP regulations provide performance standards for anchoring new buildings and foundation and fill placement standards for floodproofed buildings and V Zones.

However, the NFIP performance standards do not specify how a buildings' foundations are to be constructed. Especially in areas where an engineer's certificate is not required by the NFIP regulations, more specific foundation construction standards would help protect buildings from flood damage.

One option is to require that a registered professional engineer or architect certify the adequacy of elevated building foundations and the proper placement, compaction and protection of fill when it is used in building elevation. This is an ordinance requirement in the New Orleans area where subsidence threatens so many buildings.

The national model building codes address building foundations and the proper placement, compaction and protection of fill. You and your building department should review how these standards are enforced.

An alternative is to require a specific construction standard, such as requiring the V Zone standard for new structures in coastal AE and AH Zones. Coastal AE Zones are of particular concern, since they are subject to wave action of up to three feet in height and the NFIP A Zone construction standards do not address this hazard.



The Community Rating System credits foundation protection under Activity 430, Section 431.b in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

## SAFETY REQUIREMENTS

### Critical facilities

For some activities and facilities, even a slight chance of flooding poses too great a threat. These should be given special consideration when formulating regulatory alternatives and floodplain management plans.

The following are examples of the types of critical facilities that should be given special attention:

- ◆ Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.
- ◆ Hospitals, nursing homes and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a flood.
- ◆ Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during and after a flood.
- ◆ Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during and after a flood.

A critical facility should not be located in a floodplain. Communities often prohibit critical or hazardous facilities or uses from the floodway, the V Zone, or the entire floodplain. While a building may be considered protected from the base flood, a higher flood or an error on the builder's or operator's part could result in a greater risk than the community is willing to accept.

If a critical facility must be located in a floodplain, then it should be designed to higher protection standards and have flood evacuation plans. The more common standards—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. Executive Order 11988 is discussed further in Section E of this unit.



The Community Rating System provides credits for prohibiting critical facilities from the 500-year floodplain or requiring them to be protected from damage by the 500-year flood in Activity 430. See the *CRS Coordinator's Manual* and the *CRS Application*. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.



## Hazardous materials

While prohibiting or protecting hazardous materials from the floodplain makes sense, it would be wise to have specific standards in your ordinance. The following lists were taken from the Corps of Engineers' Flood Proofing Regulations. The first is of items that are extremely hazardous or vulnerable to flood conditions so they should be prohibited from the SFHA or even the 500-year floodplain:

Acetone	Prussic acid
Ammonia	Magnesium
Benzene	Nitric acid
Calcium carbide	Oxides of nitrogen
Carbon disulfide	Phosphorus
Celluloid	Potassium
Chlorine	Sodium
Hydrochloric acid	Sulfur

The following items are sufficiently hazardous that larger quantities they should be prohibited in any space below the base flood elevation

Acetylene gas containers	Gasoline
Storage tanks	Charcoal/coal dust
Lumber /buoyant items	Petroleum products

Larger quantities of the following items should be prohibited in any space below the base flood elevation

Drugs	Soaps/detergents
Food products	Tires
Matches/sulfur products	

## Dry land access

Fire prevention, evacuation and rescue operations are common emergency response activities associated with flooding. The 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 the BFE. Some require elevation to within one foot of the BFE so at least fire and rescue equipment can travel on them during a flood.

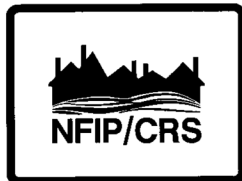
While some local officials may feel that this approach is too restrictive, it is important to note that emergency response personnel die every year attempting to rescue flood-stranded citizens. Also, others may die or be seriously injured because they cannot be rescued in time.



**Figure 6-4: Four people died in a 1978 flood in this critical facility.**

***This nursing home in Rochester, Minnesota, was isolated by high velocity floodwaters. Because there was no dry land access, firefighters could not rescue the occupants.***

Naturally, there are some areas with floodplains so extensive that a developer cannot be expected to connect his development to high ground. As with all regulatory standards, you must carefully weigh the local hazard, the regulation's objectives, and the costs and benefits of meeting the standard before you draft new ordinance language.



The Community Rating System has credited dry land access provisions under Activity 430, Section 431.i in the *CRS Coordinator's Manual* and the *CRS Application*.

## ENCROACHMENT STANDARDS

Some states and communities are not comfortable with allowing development in the flood fringe to increase flood heights by up to a foot. A one-foot increase in flood heights will increase the potential for flood damage to floodprone buildings and affect properties that were otherwise not threatened by the base flood. This is especially true in flat areas where a one-foot increase can extend the floodplain boundary by blocks.

These states and communities require floodway mapping and encroachment studies to allow a smaller surcharge, usually 0.5 or 0.1 foot. Twelve states require that regulatory maps use a smaller floodway mapping surcharge than the NFIP's

one-foot minimum standard. This results in a wider floodway, but less potential for increased flood losses due to future development.

In Minnesota, one watershed district took another regulatory approach, enacting regulations that restricted encroachments in the flood fringe to 20 percent of the total floodplain area. In Washington State, some communities treat higher velocity and deeper flood fringe areas as floodways and make development in those areas comply with the floodway construction standards.



The Community Rating System credits more restrictive floodway mapping standards under Activity 410 Additional Flood Data, Section 411.c in the *CRS Coordinator's Manual* and the *CRS Application*.

## COMPENSATORY STORAGE

The NFIP floodway standard in 44 CFR 60.3(d) restricts new development from obstructing the flow of water and increasing flood heights. However, this provision does not address the need to maintain flood storage. Especially in flat areas, the floodplain provides a valuable function by storing floodwaters. When fill or buildings are placed in the flood fringe, the flood storage areas are lost and flood heights will go up because there is less room for the floodwaters. This is particularly important in smaller watersheds that respond sooner to changes in the topography.

For this reason, some communities adopt more restrictive standards that regulate the amount of fill or buildings that can displace floodwater in the flood fringe. One simple approach is to prohibit filling and buildings on fill—all new buildings must be elevated on columns or flow-through crawlspaces.

Check your statutory authority, because in some states buildings are allowed only if they are on fill. Some communities prefer buildings on fill because floodwaters do not come in contact with the building's foundation and it provides a safe spot above flood levels outside the building walls.

Another approach is to require compensatory storage to offset any loss of flood storage capacity. The developer is required to offset new fill put in the floodplain by excavating an additional floodable area to replace the lost flood storage area. This should be done at "hydraulically equivalent" sites—fill put in below the 10-year flood elevation should be compensated by removal of soil below that elevation elsewhere in the floodplain.



The Community Rating System credits prohibition of fill and compensatory storage under Activity 430, Section 431.f in the *CRS Coordinator's Manual* and the *CRS Application*. See *CRS Credit for Higher Regulatory Standards* for example regulatory language.

## STORMWATER MANAGEMENT

A floodplain management program in an urbanizing area must confront the increase in flood flows caused by development within the watershed. As forests, fields and farms are covered by impermeable surfaces like streets, rooftops and parking lots, more rain runs off at a faster rate. In an urbanized area, the rate of runoff can increase fivefold or more.

Changes in the surface drainage system compound this problem. Stormwater runoff travels faster on streets and in storm drains than it did under pre-development conditions. As a result, flooding is more frequent and more severe (Figure 1-13). Efforts to reduce the impact of increased runoff that results from new development in a watershed are known as stormwater management.

One way to reduce the impact of stormwater from new development is to require the developer to restrict the rate at which the increased runoff leaves the property. The developer must build a facility to store stormwater runoff on the site.

Under stormwater detention, the stored water is held for release at a restricted rate after the storm subsides. Under stormwater retention, stormwater runoff is held for later use in irrigation or groundwater recharge, or to reduce pollution.

As an alternative to using a uniform standard for all areas, many communities regulate development according to a master plan that analyzes the combined effects of existing and expected development on stormwater and flood flows in the watershed. Such watershed-specific regulations may allow different amounts of runoff for different areas in order to control the timing of increased flows into the receiving streams.

Instead of requiring developers to build stormwater facilities on-site, a plan may require them to contribute funds for a regional facility. By planning the runoff from entire watersheds, this approach can be more effective in reducing increases in downstream flooding.

Stormwater management also has water quality aspects, and includes efforts to reduce erosion and the entry of sediment and pollutants into receiving streams.



The Community Rating System credits both water quantity and water quality stormwater management regulations and plans under Activity 450 in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Stormwater Management* for example regulatory language.

## TEMPORARY MORATORIUM

Following a flood, a number of communities have imposed moratoriums on rebuilding in the damaged area, effectively prohibiting floodplain development. Often, temporary measures are put in place after a flood to allow time to plan for acquisition, relocation, or redevelopment of the area, or to install flood control projects.

A temporary moratorium should specify when it will be lifted, such as “within three months or when the plan is completed, whichever is sooner.” An open ended moratorium may be viewed by a court as a taking, since the owner has no idea when he or she will be allowed to build or rebuild.