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PRACTICE FLOOD RESILIENCY



Promoting Flood Resiliency Through the Regulatory Process

By Terri L. Turner, AICP

Flooding occurs in all regions of the United States and at all times of the year.

One in three disaster declarations is a result of flooding, and an increase in population, increased development in flood-prone areas, and a predicted increase in intensified rain events due to climate change will only exacerbate those numbers.

Flood resiliency can be defined as the integration of roles, responsibilities, and governance necessary to adapt to the various risks associated with flooding and the ability to withstand and rapidly recover from disruptions in function after a flood event.

Successful flood resiliency should begin at the community level with individuals taking personal accountability for their relationship to the environment around them and the associated risk that this environment can impose. Unfortunately, resiliency is, all too often, viewed by the general public as being the exclusive responsibility of local, state, or federal governments. Many mitigation and planning practitioners attribute this mindset to a lack of public outreach and education about risk and resiliency. In other words, we haven't done enough to foster a culture in which hazards, such as flooding, are identified, planned for, and then mitigated so that the vulnerability to the disaster is lessened and the community's ability to withstand and rapidly recover from the disaster is increased.

The regulatory process is an essential tool in the arsenal of fighting floods and promoting flood resiliency. Zoning, building codes, and other regulatory measures can ensure that fewer vulnerable structures are built in flood-prone areas, fewer lives are put at risk, and fewer losses, to both prop-



➦ In January 2010, the Rocky Creek in Augusta, Georgia, flooded several homes. However, the frequency and duration of damaging flooding events has been reduced dramatically since the city revised its floodplain ordinance in 2000.

erty and people, are incurred due to unwise development patterns.

A LOOK AT THE NFIP

The National Flood Insurance Program (NFIP) was developed in 1968 as a part of the National Flood Insurance Act. The NFIP is a voluntary agreement between the federal government and participating communities in which the federal government offers subsidized flood insurance to communities that agree to adopt and enforce a flood ordinance that, at a minimum, meets the federal standards to reduce future flood risk to new construction in floodplains. Flood insurance, now provided to nearly 20,000 communities across the United States through the NFIP, was designed to provide an insurance alternative to disaster assistance and also to reduce the escalating costs of repairing damage to buildings and their contents after a flood event. Buildings constructed in accordance with minimum NFIP building standards suffer approximately 80 percent less damage annually than those buildings not built in compliance with the minimum standards.

Without homes and workplaces that are resilient to natural disasters, there is no chance of a sustainable local economy. While the NFIP has been the most cost-effective hazard mitigation tool in the history of this nation, flood losses in the United States continue to worsen. In fact, these increasing flood losses can be attributed, in part, to federally backed flood insurance that encourages at-risk development in the Special Flood Hazard Area (SFHA). Consequently, there is still a gap in land-use regulation

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About the Author

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that must be filled in order to promote flood resiliency.

PLANNING FOR FLOOD RESILIENCY

The purpose of the local comprehensive plan is to articulate a long-term community vision for growth and change. Consequently, it is important for the comprehensive plan to address the community’s propensity to hazards and the likely effects of climate change on the overall makeup of the community. The plan should also include goals and policies to promote community resiliency. While comprehensive plans are not law, most states require local development regulations to be in conformance with the vision presented in the plan.

Another important document for promoting flood resiliency is the climate action plan, which may be a stand-alone plan or adopted as an element of the local comprehensive plan. The purpose of a climate action plan is to outline mitigation and adaptation strategies to help the community cope with changing climate conditions, such as a higher frequency of extreme storm events.

Similarly, hazard mitigation plans form the foundation for a community’s long-term strategy to reduce disaster losses. Communities that embrace the mitigation planning process generally recover rapidly from floods and other disasters and thus are found to be more prepared, sustainable, and resilient places to live and work. Furthermore, a 2005 study conducted by the Multihazard Mitigation Council concluded that every dollar spent on mitigation saves

society an average of four dollars on damage and recovery.

FLOODPLAIN MANAGEMENT ORDINANCES

The single most important local regulatory tool for flood resiliency is the floodplain management ordinance. Successful floodplain management ordinances typically exceed the minimum standards of the NFIP and include, but are not limited to, provisions addressing the following:

- Increased freeboard
- Higher protection standards for critical facilities (e.g., hospitals, schools, and government buildings)
- Prohibitions against hazardous materials in the SFHA
- Prohibitions against relocating channels or watercourses or erecting barriers that cause an impact to flood heights both up- and downstream
- Prohibitions against fill in the SFHA
- Requirements for compensatory storage in the floodplain
- Mapping and regulating areas known to flood, or where there is historical evidence of flooding, that are not mapped on the Flood Insurance Rate Map (FIRM)

- Preservation of parts of the community’s floodplains as open space
- Higher regulatory standards for riparian areas (riparian buffers)
- Habitat protection
- Designation of Coastal High Hazard Areas and associated regulatory requirements such as planned development requirements or clustering requirements
- Zero-rise (regulatory) floodways

It is important for the comprehensive plan to address the community’s propensity to hazards and the likely effects of climate change on the overall makeup of the community.

- Designation of planning areas with special objectives, which may include protection and preservation of fishery and wildlife habitats, scenic and recreational areas, and other natural resources.

Many of these provisions are found in the Community Rating System (CRS)—a voluntary incentive program of the NFIP, which recognizes and encourages floodplain management activities that exceed the minimum standards of the NFIP. The aim of the program is to reduce and avoid flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and to foster comprehensive floodplain management. The “reward” to those

communities that successfully implement the higher regulatory standards found in the CRS is lower flood-insurance premiums for the property owners in the community. CRS discounts on flood insurance range from five to 45 percent and are based on the classification the community receives based on the effectiveness of their local program. Activities that increase the community's public safety, reduce property damage, avoid economic disruption and loss, and protect the environment may be counted for CRS credit. Additionally, the program encourages innovative ways to prevent or reduce flood damage.

(2000) floodplain areas and the newly projected floodplain, the county discovered there would be an estimated \$333 million in additional damages under maximum build out. In response to these findings, the county revised its zoning code and land-use regulations based on the projected change in the floodplain. A new minimum base flood elevation for future development (one foot above the level to which flood waters are expected to rise) and set of stream setback requirements limit development to areas outside of the floodplain and protects against losses from future flooding.

nances or added to the zoning code as an overlay.

Iowa City, Iowa

Iowa City adopted its current SAO in 2005. With respect to flood hazard areas, the SAO establishes a 50-foot buffer between development activity and the Iowa River floodway; a 30-foot buffer between development and floodways of tributaries to the Iowa River; and 15-foot buffers on either side of an assumed 30-foot-wide stream corridor for blue-line tributaries without a delineated floodway. The SAO increased distances between development activity and bodies of water and remains an effective means of preserving flood storage areas, reducing the likelihood of flood damage to structures, and providing opportunities for recreational trails and open space.

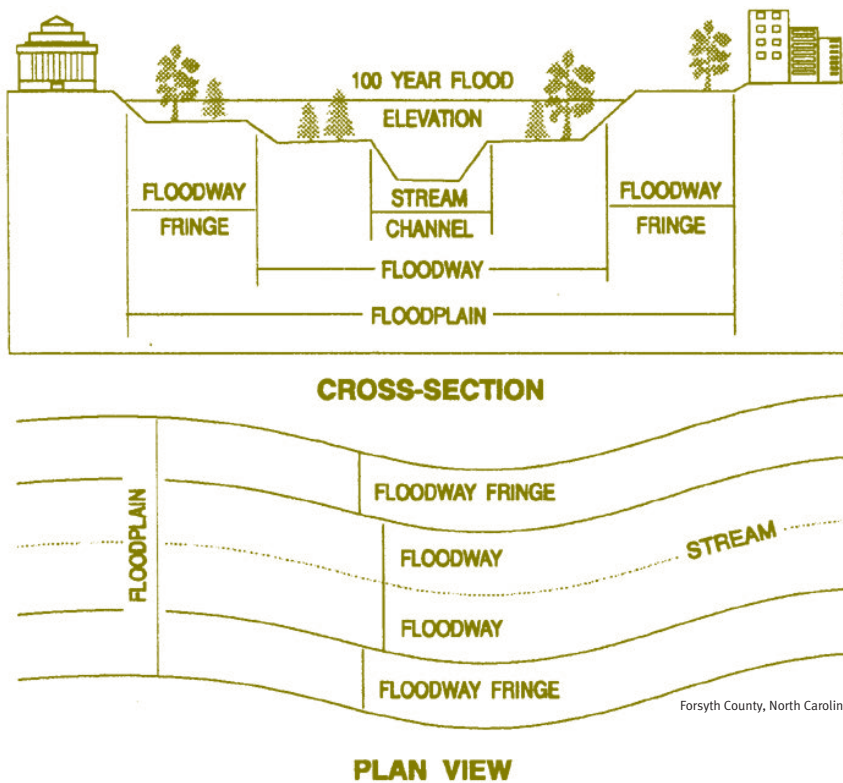
In 2010 Iowa City incorporated new floodplain management standards into its zoning ordinance. According to Julie Tallman, Iowa City's developmental regulation specialist, "having been employed at City Hall since 1993, it is my opinion that the combination of our SAO and the new floodplain regulations have strengthened our ability to preserve the natural functions and beauty of the surrounding landscape, reduce the potential risk to structures, and protect our population."

STORMWATER MANAGEMENT ORDINANCES

A number of communities use stormwater management ordinances (SWMOs) to regulate the amount of stormwater runoff that can leave new developments. SWMOs often require higher runoff standards in watersheds and basins with a propensity to flood. Additionally, the SWMO may require higher standards for best management practices (BMPs) and higher standards for protecting natural and beneficial functions of water courses that far exceed the state or federal standards. This may include provisions such as stream buffers, which prohibit disturbing vegetation along the banks of a watercourse. In many states this buffer is regulated as part of the state's National Pollutant Discharge Elimination System program.

BUILDING CODES

Communities can also incorporate higher standards into their building codes to promote flood resiliency. Requiring new buildings to be constructed on flow-through



- ➡ In order for property owners to be eligible for flood insurance through the NFIP, community floodplain ordinances must restrict all building in the floodway and must require all habitable structures to be raised above the 100-year flood elevation.

Charlotte-Mecklenburg, North Carolina

In Charlotte-Mecklenburg County, North Carolina, planners have used their current land-use zoning regulations to analyze maximum build out of future development and how the potential development will affect current floodplain designations. Comparing the potential flood damages that would likely occur under the maximum build-out scenario with both the current

SENSITIVE AREAS ORDINANCES

Many communities have areas of special environmental sensitivity, such as wetlands, frequently flooded areas, aquifer recharge zones, fish and wildlife habitat corridors, and geologically sensitive areas. To guard these features some communities adopt sensitive area ordinances (SAOs) to limit development on or near sensitive lands. SAOs may be stand-alone ordi-

foundations rather than on fill is useful for floodwater storage. Local building codes may also require an increased elevation standard (freeboard) above the base flood elevation. This ensures that structures are elevated on properly designed and constructed foundations and have the required flood openings and will result in lower flood insurance premiums.

Furthermore, having a Building Code Effectiveness Grading Schedule classification of 5 or better from the Insurance Services Office or having adopted all or part of the higher regulatory standards of the International Building Code may be a vital tool in promoting flood resiliency in the community. Another source for more stringent building code requirements is the American Society of Civil Engineers' (ASCE)

CONSERVATION SUBDIVISION STANDARDS

In a conservation subdivision, the residential density is typically the same or, in some cases, higher than in a conventional subdivision. However, in a conservation subdivision the residential units are clustered together on smaller lots, leaving a large percentage of the total site undisturbed. Steering development away from the floodplain and other environmentally sensitive areas of a site without reducing the potential density of the site can be a politically palatable way to reduce potential flood damage and help maintain flood storage and conveyance capacity. Consequently, many communities have adopted provisions sanctioning conservation design in either their subdivision or zoning ordinances.

Augusta's decisions to accept greenspace from conservation subdivisions are based, in part, on the city's community greenspace plan. The state of Georgia's Community Greenspace Program provides funding to help urban and rapidly developing cities and counties set aside 20 percent of their land as permanent open space. As part of Augusta's participation in this program, the city has adopted a community greenspace plan that includes policies and specific proposals to provide permanent protection of environmentally sensitive areas.

OVERLAY DISTRICTS

Overlay districts superimpose additional regulations on underlying mapped zoning districts. Like conventional zoning districts,



Myrtle Beach uses its Coastal Protection zoning overlay to limit new development seaward of the 50-year erosion control line.

Flood Resistant Design and Construction standard (ASCE 24-05). ASCE 24-05 requires a one-foot freeboard for most structures and up to three feet for critical facilities. Compliant building codes also

- account for instability and decreased structural capacity associated with erosion, scour, and shoreline movement as part of foundation design for buildings in coastal areas and
- prohibit construction of structures in certain high-risk areas such as alluvial fans, flash-flood areas, mudslide areas, erosion-prone areas, high-velocity-flow areas, and ice-jam and debris areas.

Augusta, Georgia

Augusta's zoning ordinance permits conservation subdivisions in a number of low-density residential districts by right when all lots are at least 60 percent of minimum district lot sizes and by special exception when one or more lots are less than 60 percent of minimum district lot sizes. To qualify, the minimum tract size must be 20 acres and a minimum of 40 percent of the overall acreage of the tract must be permanently protected as greenspace. The developer may either dedicate the greenspace to a public entity, a home owners' association, or a land trust, subject to approval of a greenspace management plan by the city.

overlays consist of both mapped boundaries and zoning text. The boundaries of an overlay may not correspond to the boundaries of underlying zoning districts or even to parcel boundaries. For example, many communities use zoning overlay districts to protect floodplains and riparian areas whose boundaries seldom follow property lines.

Overlays in Vermont

Communities in Vermont often use flood hazard districts to impose additional site and building standards for development located within a mapped flood hazard area. Similarly, a number of counties in Vermont use fluvial erosion hazard corridor overlay

GLOSSARY

- **Base Flood Elevation (BFE)** is the computed elevation to which floodwater is anticipated to rise during the one percent annual chance flood (the base flood). The BFE is the regulatory requirement for the elevation or the floodproofing of structures, both commercial and residential. The relationship between the BFE and a structure's existing elevation determines the flood insurance premium.
- **Coastal High Hazard Areas (CHHA)** is the area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high-velocity wave action from storms or seismic sources. The CHHA is identified as Zone V on Flood Insurance Rate Maps (FIRMs). Special floodplain management requirements apply in V Zones, including the requirement that all buildings be elevated on piles or columns.
- **Compensatory storage** is that area that is required, for storage of floodwaters, to offset the impacts of buildings, fill, and impervious surfaces within the floodplain.
- **Flood Insurance Rate Map** is a map on which the 100-year (one percent annual chance) and the 500-year (0.2 percent annual chance) floodplains, Base Flood Elevations (BFEs), and regulatory floodways are delineated to enable insurance agents to accurately rate flood insurance policies for home owners and business owners in communities participating in the National Flood Insurance Program.
- **Freeboard** is a factor of safety, usually expressed in feet above a known flood level, for purposes of floodplain management, and usually expresses the height above the BFE at which insurable structures must be built.
- **Regulatory floodway** means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations.
- **Special Flood Hazard Area** is the area subject to inundation by a flood that has a one percent or greater chance of being equaled or exceeded during any given year. This type of flood is commonly referred to as the "100-year flood" or the "base flood".
- **Zero-rise (regulatory) floodways** is a designated regulatory floodway where no increase in flood heights occurs during the base flood, even those increases that are negligible and do not change the BFE. In communities that use a zero-rise floodway, the Federal Emergency Management Agency floodway is generally enlarged to include almost the entire floodplain. Fill and other encroachments are not allowed in the zero-rise floodway.

districts to prohibit new structures and fill in the SFHA. Additionally, in Calais, Vermont, the use of large lot sizes in the city's Upland Overlay District protects sensitive upland areas from the adverse effects of inappropriate or high-density development.

Myrtle Beach, South Carolina

Myrtle Beach uses its Coastal Protection (CP) overlay zone to control erosion, preserve and maintain a recreational beach, safeguard property, and promote public safety. The overlay prohibits seawalls and new structures in an area bound by the top of the primary frontal dune system adjacent to the Atlantic Ocean and marked landward by drawing a line parallel to the primary frontal dune line equivalent to 50 times the annual beach erosion rate (which exceeds the state standards by 10 times the erosion rate). The regulations apply to all oceanfront property, with slight exemptions given to two historic pier structures located in the city limits. According to Allison Hardin, the city's planner and former floodplain manager, "in cases of reconstruction, if retreat is not possible, it is intended that existing buildings may be replaced without exceeding the gross square footage of the existing building and without any portion of the footprint of the building located in the CP district being exceeded."

TRANSFER OF DEVELOPMENT RIGHTS

Transfer of development rights (TDR) is a land preservation tool wherein a property owner yields some or all of the right to develop or use his or her property in exchange for the right to develop or use another parcel of property more intensively. Communities with TDR programs designate sending areas (where development rights can be purchased) and receiving areas (where purchased development rights can be applied).

Kent County, Delaware

Kent County has had a TDR program, administered by its planning department, since 2005. Under the county's program, participants must record an irrevocable preservation easement to memorialize the separation of the development rights from the property. Property owners who have transferred development rights from their land may continue to use the land for any purpose or use permitted by right by their zoning district *except* residential subdivision. While ownership of the land may be transferred, the residential development restriction remains with the land in perpetuity.

ENGINEERING CERTIFICATIONS

Finally, some communities, such as DuPage County, Illinois; Greenville, South Carolina; and Arlington, Texas, require engineering certifications to insure adherence to sound floodplain management standards. Bill Brown of the City of Arlington describes the theory: "Requiring strong technical analysis and establishing technical performance standards goes a long way to facilitate development that is safer from flood risks, while avoiding the takings issues." As Brown explains, the city is not saying *no*, but by imposing this certification requirement, some projects that would otherwise proceed become financially impractical. "The traditional method of zoning has limited liability at best," says Brown. "The strong technical analysis and performance standards that are signed by a licensed professional carry (personal and professional) liability."

THE TAKINGS ISSUE

Obviously, there are many regulatory tools at the community's disposal to oversee development and promote flood resiliency. Sadly, many communities fail to adequately regulate through zoning or other regulatory mechanisms, in relation to flood prevention, for fear of the takings issue. Yet a failure to regulate may set a community up for common law liability suits.

According to a 2008 article by Edward A. Thomas and Sam Riley-Medlock in the *Vermont Journal of Environmental Law*, there have only been a handful of successful challenges to floodplain regulations as a taking. In those cases, a nearly complete prohibition of building on the property was found to have occurred with no clearly demonstrated hazard-related benefit for the community. The Thomas-Medlock research concluded that the trend is for the courts to sustain government regulation of hazardous activities for the prevention of harm.

In communities that fail to adequately administer their own regulations, however, governments have been held liable for negligence or nuisances where the government has issued a development permit that increased flood heights, flood magnitudes, or flood intensity on other property. In research prepared for the Association of State Floodplain Managers (ASFPM) Foundation, Jon Kusler explained that courts have supported regulations that exceed the NFIP standards, provided those regulations were enacted in furtherance of public safety and do not deny all use.

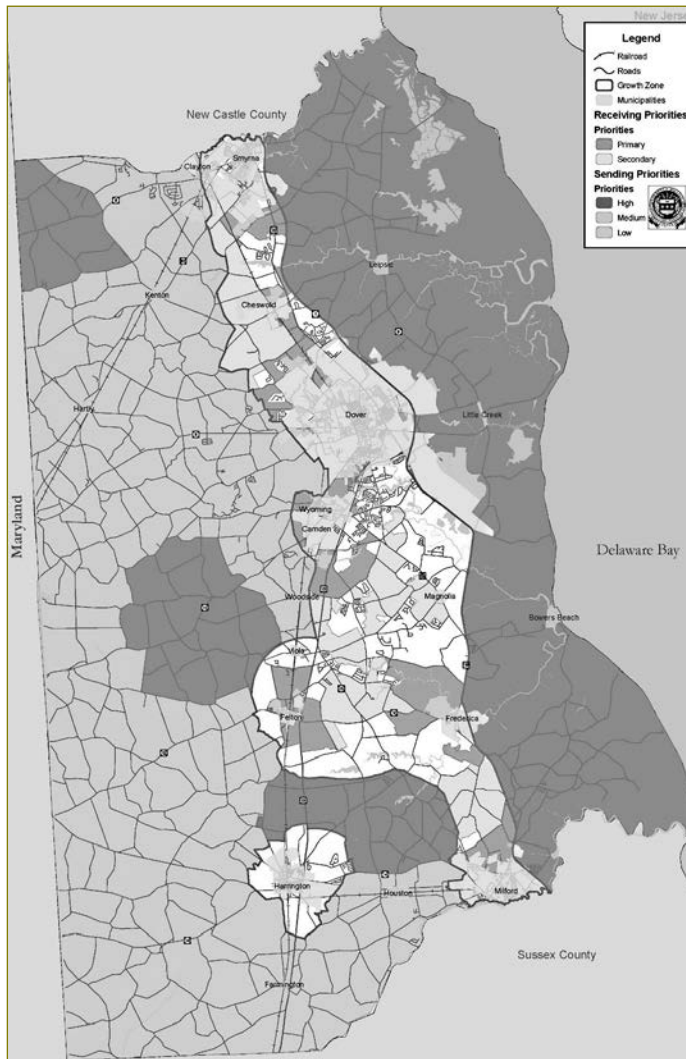
LOOKING FORWARD WHILE LOOKING BACK

Local governments are challenged daily to regulate hazardous locations, while at the same time being sensitive to the deep and abiding concerns of the property-rights movement. Many believe that the answer is in a maxim of ancient Roman law expressed in Latin as *Sic utere tuo ut alienum non laedas*. In English, “Use your own property so that you do not injure another’s property.” One thing upon which virtually all legal philosophers agree is that nobody possesses a right to use their land to harm others.

ASFPM has developed a philosophy that attempts to capture the concept of managing land use in such a manner as to not harm one’s neighbors: No Adverse Impact Floodplain Management (NAI). ASFPM defines NAI as “. . . an approach that ensures the action of any property owner, public or private, does not adversely impact the property and rights of others.” This principle makes a community look at what really needs to be done to prevent damage to people, property, and the environment.

In 1543, when Hernando De Soto’s expedition observed the earliest recorded significant flood of the Mississippi River, they noted that the indigenous communities “built their houses on the high land, and where there is none, they raise mounds by hand and here [took] refuge from the great flood.” Fast forward from 1543 to modern day, where, in the last 100 years, more than 9,000 people have died as result of inland flooding in the United States.

Obviously, the nation must rethink its basic approach to flood-risk reduction and floodplain management. Roles must be defined, responsibilities must be assigned, and governance, via the regulatory process, must be at the forefront of all we do within the community in order to adapt to the various risks associated with flooding and in order to have the ability to withstand and rapidly recover from disruptions in function after a flood event. What we do today can shape the future of our communities, in terms of flood resiliency, and significantly impact the lives of millions of Americans. We have a conscious choice: Do we take personal responsibility and move forward, carefully and cautiously, adapting our regulations to promote flood resiliency as we proceed, or do we continue on the path of least resistance, perpetuating the cycle of build-damage-rebuild-damage, that far too many communities have traveled on in the past?



➔ Kent County, Delaware, uses a transfer of development rights program to preserve land outside of the county’s designated growth zone.

Cover image: Conservation design encourages the protection of environmentally sensitive areas without reducing residential densities. *Source:* Randall Arendt

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HOW FLOOD RESILIENT IS YOUR COMMUNITY?

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