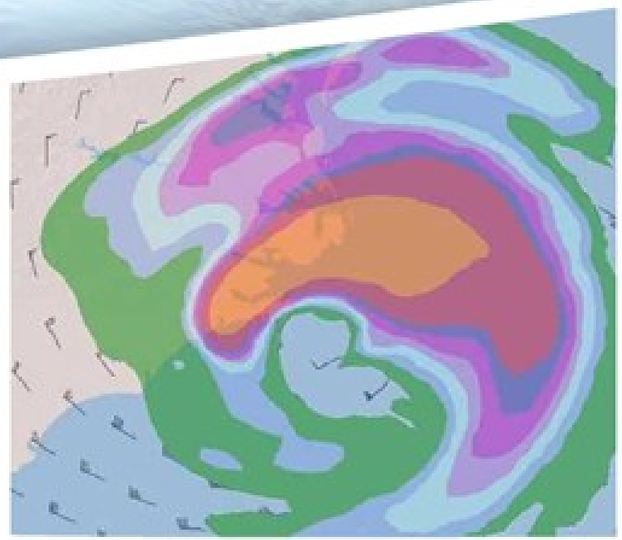
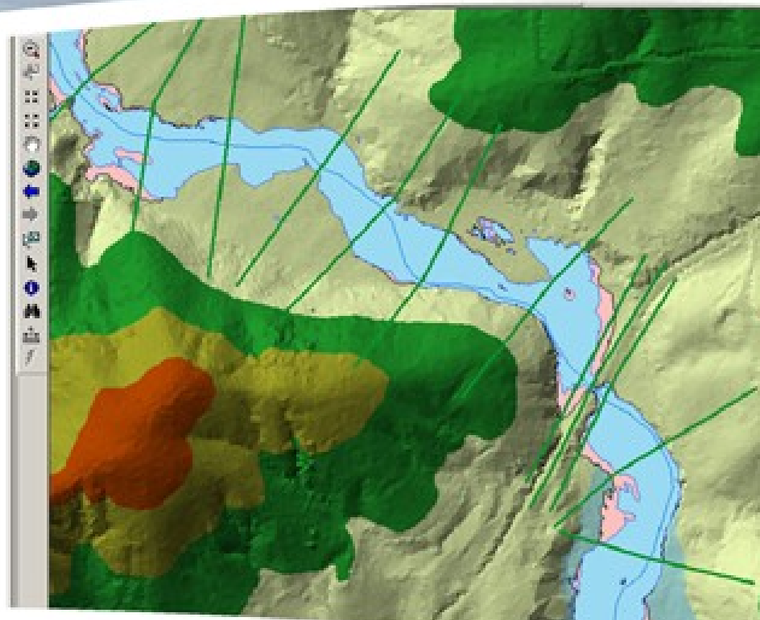
BEST PRACTICES GUIDEBOOK:

Community Disaster Resilience





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Georgia Department of Community Affairs

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ACKNOWLEDGEMENTS

BEST PRACTICES: ***How to Use This Guidebook***

Background

To assist Georgia counties and cities with preparedness for natural hazards and disaster resiliency, the Georgia Department of Community Affairs (DCA) conducted a comparative analysis of the adopted hazard mitigation plans and comprehensive plans of local governments in 20 Georgia counties that were impacted by flooding, severe storms and tornadoes in 2008. The resulting reports describe the benefits of – and recommended strategies for – coordinating land use planning with hazard mitigation planning. This guidebook presents "Best Practices" recommendations drawn from the comparative analyses, from agency publications, and from experts in the fields of hazard mitigation and land use planning. These Best Practices can be incorporated into planning activities, but also include specific actions that can be taken to implement plans and policies.

Organization

This guidebook includes Best Practices for community disaster resiliency with regards to future flooding, severe storm, and tornado events. Recommended Best Practices are categorized by these three categories. The list of specific sub-topics is shown at right. Each Best Practice page in this guidebook includes the following components:

- **Applicability** – Indication of applicability of the Best Practice to one or more of six types of hazard mitigation and disaster resiliency measures (found across the top of each page): Prevention, Property Protection, Natural Resources Protection, Emergency Services, Structural Projects and Public Information.
- **Recommendations** – Specific recommendations for policies, procedures and other actions appropriate for local governments.
- **Key Concepts or Definitions** – Includes definitions and descriptions of key concepts associated with recommendations.
- **References to Resources** – Either within recommendations or in a resources call-out box at the bottom of the page, references to technical references and other resources for additional information are provided. A compilation of these resources, including web addresses, is provided on pages 13 and 14 of this guidebook.

Audience

The Best Practices presented in this guidebook are described at a summary level and are intended to be comprehensible to a broad audience, including those who have a non-technical understanding of hazard mitigation and land use planning. Generally, the Best Practices are intended for use by local governments, to be initiated or promoted by local officials and staff. Technical references and resources indicated on each page will be useful to professional planners, emergency managers, and other local government managers and technicians.

Bottom Line

Most communities in Georgia have an approved hazard mitigation plan. Most communities in Georgia also have an adopted comprehensive land use plan. These plans establish important local policies that pertain to disaster mitigation and resilience. However, local planners and others who author comprehensive plans are often not involved in hazard mitigation planning, while emergency management professionals with responsibility for hazard mitigation plans often are not directly involved in comprehensive planning. Coordinated planning is needed to ensure consistency among local plans, policies and programs. Participation by emergency managers, floodplain managers, engineers and community planners can benefit both hazard mitigation plans and comprehensive plans. Ideally, updates to a community's comprehensive plan and hazard mitigation plan should take place simultaneously. This can be facilitated by DCA if plan update deadlines do not align. This guidebook is intended to address topics that can be addressed during these plan updates and also implemented by local staff outside of plan updates. *See page 11 for more information.*

Table of Topics

Other DCA Resources

In conjunction with this guidebook, the DCA **Community Planning Institute (CPI)** has a training curriculum for local government staff and officials on the topic of integrating hazard mitigation and land use planning. The 20 **comparative analysis reports** (see "Overview" at left) are also posted on DCA's website for use as reference materials. **www.dca.ga.gov**

BEST PRACTICES: ***Floodplain Regulations***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Consider Higher Standards:

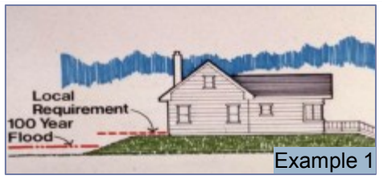
1. **Increase freeboard.** Elevating a building's lowest floor, generally one to three feet above the Base Flood Elevation (BFE), can help to protect a building from flood damage. In addition, communities that participate in the National Flood Insurance Program (NFIP) benefit from significantly lower flood insurance rates by adopting additional height, or "freeboard," standards. State (DNR) model ordinances, cited below, require a minimum one foot standard for areas where BFEs have been established. Every additional foot of freeboard beyond the minimum requirement results in a greater reduction in flood insurance (*see Figure 1-1*).
2. **Prohibit earthen fill** in the entire special flood hazard area ("floodplain"), which includes both the floodway and the floodway fringe (*see Figure 1-2*). Floodplain regulations often prohibit fill in the floodway. The best practice is to also prohibit fill in the floodway fringe so the entire floodplain is addressed. When fill is placed in the floodway fringe, floodwater storage capacity is lost and flood elevations increase.
3. **Allow compensatory storage** as an alternative to prohibition of fill in smaller floodplain areas. With this approach, new fill in the floodplain is required to be offset by excavating an additional floodable area to replace the lost flood storage area. Specific locations should be determined "hydraulically equivalent" by a professional registered engineer (e.g. fill placed below the 10-year flood elevation should be compensated by removal of soil below that elevation elsewhere in the floodplain).
4. **Adopt cumulative substantial improvement standard** to prevent or reduce flood damage to existing buildings. Floodplain regulations typically require structures be brought into compliance with new construction standards only in cases where substantial improvements are made. "Substantial improvement" is defined as reconstruction, rehabilitation, addition or other improvements, the total cost of which equals or exceeds 50% of the market value of the structure before construction starts. The best practice gives cumulative consideration, such that all improvement projects undertaken over several years (e.g. 5 years, 10 years, or the life of the structure) are added up. When the cumulative total is 50%, the building must be brought into compliance as if it were new construction.
5. **Prohibit construction of critical facilities in the floodplain**. Critical facilities are structures, infrastructure and utilities that are essential to the health and welfare of a community, especially following a natural disaster. Examples are hospitals, schools, fire and police stations, and water and sewer treatment plants. Prohibiting the placement of critical facilities in the 100-year and/or requiring the facilities to be elevated one foot above the 500-year floodplain can allow these facilities to remain accessible and operational during a flood.
6. **Establish enclosure limits.** Floodplain regulations for coastal high hazard areas (V-Zones) generally require new construction to be elevated on pilings, columns or shear walls (*see Figure 1-1, Example 2*). The space below the lowest supporting member is typically allowed to have non-supporting breakaway walls (e.g. lattice work) and enclosed walled-in areas ("enclosures") of 299 square feet or less for storage and building access. Higher standards include either prohibiting breakaway walls *or* prohibiting all enclosures, including breakaway walls, due to the potential for the building materials to become debris during a flood.

Model floodplain regulations and supporting publications are available as resources for Georgia communities. Some resources contain higher standards. The list at right indicates those that address the standards described above. (See list of resources on pages 13 and 14 for more information.)	*Model Flood Damage Prevention Ordinance – Riverine Communities (GA DNR)* 5	*Model Flood Damage Prevention Ordinance (DCA)* 1 3 4
	Model Flood Damage Prevention Ordinance – Coastal Communities (GA DNR) 5	*Model Floodplain / Flood Damage Prevention Ordinance (Metropolitan North Georgia Water Planning District)* 1 2 3
	National Flood Insurance Program (NFIP) Community Rating System (CRS) – Coordinator's Manual, Section 430 6	

Key Definitions

Freeboard is the height above the Base Flood Elevation (BFE) at which a structure is built. **BFE** is the elevation of surface water resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year.

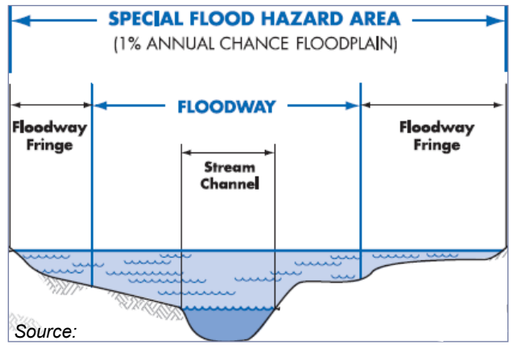
Key Concepts



Example 1


Example 2 (coastal)

Figure 1-1: Higher freeboard examples



Source: *Floodplain Management in Georgia – Quick Guide (GA DNR)*

Figure 1-2: Illustrative definition of "Special Flood Hazard Area" (SFHA)

BEST PRACTICES: ***Flood-Resistant Construction***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Adopt DCA Disaster Resilient Construction Appendices to address:

1. **Flood damage-resistant materials.** Building materials are required to comply with FEMA Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazards Areas in accordance with the National Flood Insurance Program.* The bulletin lists structural and finish materials commonly used in construction of floors, walls, and ceilings (*see partial list in Figure 2-1*).

2. **Location of flood damage-resistant materials.** Building components and materials located below the increase* to the base flood elevation (BFE) as determined by the local jurisdiction are required to be flood resistant.

   *NOTE: The DRC Appendices includes options for increased freeboard. Freeboard is the height above the BFE at which a structure is built (*see also page 1*). Communities are encouraged to adopt a higher freeboard standard than they are currently enforcing. The DRC Appendices can be a tool for increasing freeboard; additionally, amending floodplain regulations is encouraged as a best practice (*see page* 1).

3. **Fasteners and connectors used for flood damage-resistant materials.** The fasteners and connectors used to put building components together can affect how a building withstands the effects of flooding. Examples of fasteners are nails, screws, bolts, brick ties, and anchors. Connectors are manufactured devices used to connect two or more building components. Examples are joist hangers, post bases, hurricane ties and clips, and mud-sill anchors. The DRC Appendices specify rust-resistant fastener and connector types.

The list at right indicates the DRC Appendices that address the standards listed above. (See list of resources on pages 13 and 14 for more information.)	
	Appendix N (for the IBC) 1 2 3
	Appendix R (for the IRC) 1 2 3

Table 2. Types, Uses, and Classifications of Materials

Types of Building Materials	Uses of Building Materials		Classes of Building Materials				
			Acceptable		Unacceptable		
	Floors	Walls/ Ceilings	5	4	3	2	1
Structural Materials (floor slabs, beams, subfloors, framing, and interior/exterior sheathing)							
Asbestos-cement board		■	■				
Brick							
Face or glazed		■	■				
Common (clay)		■		■			
Cast stone (in waterproof mortar)		■	■				
Cement board/fiber-cement board		■	■				
Cement/latex, formed-in-place	■			■			
Clay tile, structural glazed		■	■				
Concrete, precast or cast-in-place	■	■	■				
Concrete block[1]		■	■				
Gypsum products							
Paper-faced gypsum board		■			■		
Non-paper-faced gypsum board		■		■			
Greenboard		■				■	
Keene's cement or plaster		■			■		
Plaster, otherwise, including acoustical		■				■	
Sheathing panels, exterior grade		■			■		
Water-resistant, fiber-reinforced gypsum exterior sheathing		■		■			
Hardboard (high-density fiberboard)							
Tempered, enamel or plastic coated		■				■	
All other types		■					■
Mineral fiberboard		■					■
Oriented-strand board (OSB)							
Exterior grade	■	■				■	
Edge swell-resistant OSB	■	■				■	
All other types	■	■					■
Particle board	■						■
Plywood							
Marine grade	■	■	■				
Preservative-treated, alkaline copper quaternary (ACQ) or copper azole (C-A)	■	■		■			

Figure 2-1: Excerpt of table from FEMA Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements for Buildings*

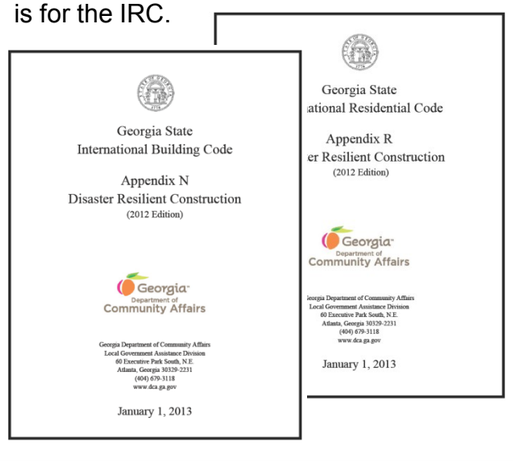
Key Concepts

Code +

DCA's Disaster Resilient Construction (DRC) Appendices for the International Building Code (IBC) and the International Residential Code for One- and Two-Family Dwellings (IRC) contain improved and/or new provisions relating to hurricane, flood and tornado disasters.

The optional appendices contain increased construction requirements (**code plus**) for disaster resilience that may be adopted in whole or part and are available for adoption by local jurisdictions in the State of Georgia.

Appendix N is for the IBC and Appendix R is for the IRC.



BEST PRACTICES: ***Improved Hazard Mapping***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Better Mapping Makes a Difference:

1. **Improve local flood hazard maps.** FEMA's Flood Insurance Rate Maps (FIRMs) delineate the Special Flood Hazard Area (SFHA) in a community, providing a general understanding of whether a property is located inside or outside of the SFHA. More detailed mapping techniques can supplement the basic information provided on a FIRM to better communicate flood risk. For example, depth grids (*see Figure 3-1*) predict water depth across floodplain property during a base flood. Other tools such as Hazus-MH (*see Key Definitions at right*) can enhance flood hazard mapping through a robust data set that defines which buildings, essential facilities and other transportation and transmission infrastructure in a community are vulnerable to the flood hazard.

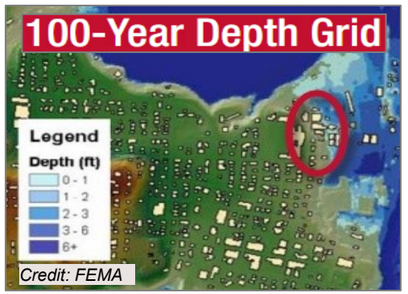


Figure 3-1: Excerpt of a depth grid map

2. **Incorporate other natural hazards into mapping.** The mapping of known hazards specific to a community (e.g. coastal erosion, subsidence, or tornadoes – *see Figure 3-2*) or potential hazards (e.g. land slides due to the presence of steep slopes), can lead to a better understanding of the risks and potential impacts to people, property and infrastructure. A comprehensive approach to hazard mapping helps communities to better communicate risk to the public. Planners benefit from mapping that shows the geographic reach of natural hazards. Mapping of data concerning the variety of natural hazards allows more accurate assessment of the potential impact on future development areas and helps to identify which areas are most appropriate for development.

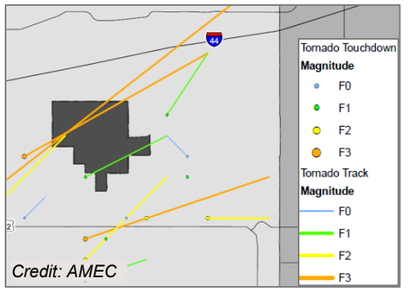


Figure 3-2: Excerpt of a map showing tornado touchdown locations

3. **Use consistent mapping for hazard mitigation plans and comprehensive plans.** A primary purpose of planning is to protect the health, safety and welfare of residents in a community. Detailed, consistent mapping helps communities achieve this goal in both hazard mitigation plans and comprehensive land use plans. Hazard mitigation plans should include maps used in comprehensive planning, and comprehensive plans should include hazard mapping. And to adequately prepare for response and recovery (hazard mitigation planning) and future growth (comprehensive planning), it is essential to provide a high level of detail on maps, including the delineation of parcel boundaries, streets, and the geographic extent of potential natural hazards (*see Figure 3-3*).

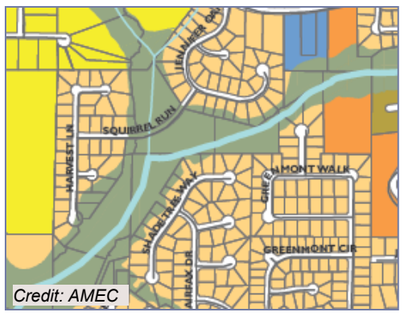


Figure 3-3: Excerpt of a comprehensive plan's Future Development Map showing floodplain, lot lines and street labels

Key Definitions

Special Flood Hazard Area (SFHA) is the area that would be covered by waters of the **base flood** (or, "100-year flood" or "1 percent annual chance flood").

Hazards-United States Multi-Hazards (Hazus-MH) is a GIS-based disaster risk assessment tool. It was developed by FEMA to help communities predict estimated losses from floods, hurricanes (high winds), and earthquakes. *See list of resources on pp.13-14 for more information.*

Key Concepts

Detailed mapping is critical for visualization and decision-making in both hazard mitigation plans and comprehensive land use plans. Ideally, maps should provide a property-by-property level of detail.

Basic map elements should include (based on the availability of digital data):

- ✓ *Parcel boundaries*
- ✓ *Major highways, roads and streets*
- ✓ *Geographic extent of potential natural hazards*

Communities with in-house GIS mapping capability can create/maintain pertinent local information such as lot lines, utilize Digital Flood Insurance Rate Map (DFIRM) floodplain data, and generate more detailed hazard maps with Hazus-MH training. Regional Commissions and DCA can provide technical assistance for all communities, with or without trained GIS staff.

BEST PRACTICES: ***Open Space Preservation***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☐ Emergency Services ☑ Structural Project ☐ Public Information

Proactively benefit floodplain management through open space preservation:

1 Adopt land use policies and ordinances to permanently preserve open space.

- Use the Comprehensive Plan to establish policies that encourage floodplains to be preserved as open space (undisturbed, agricultural, low-density residential or recreation use) or undeveloped land.
- Prepare Greenspace Master Plans to designate areas and/or corridors for open space preservation and recreation use.
- Limit new development and increase open space in floodplains through zoning overlays or stand-alone ordinances (e.g. increase stream buffer requirements through a riparian buffer zoning overlay district or a stream buffer protection ordinance – see also #3 and model ordinances list below, as well as *Best Practices: Floodplain Regulations* on page 1).
- Encourage Conservation Subdivisions or Clustered Development (see model ordinances list below) and/or modify Planned Unit Development zoning to encourage clustered homes and preserved open space, including floodplains and other natural areas (see also *Figure 4-1*).

2 Plan, design and engineer public parks and open space improvements to include flood control features.

- Develop citywide/countywide parks and recreation master plans that recognize opportunities for floodplains to become parks or public greenspace.
- Develop master plans for individual parks and greenspaces to plan for appropriate recreation uses within and near floodplains.
- Plan and design trails along greenways in floodplains to create linear parks, and include interpretive/educational signage with information about the function and importance of floodplains.
- Design and engineer parks so that recreation facilities within floodplain areas are resilient and stormwater infrastructure serves to enhance flood control capacity. Use Green Infrastructure methods for sustainable stormwater management (see also *Best Practices: Stormwater Management* on page 5).

3 Adopt natural resource protection ordinances.

- Adopt ordinances designed to protect both open space *and* floodplain functions. Ordinances that protect river corridors, streams, wetlands and watersheds generally include buffer, setback, use and/or development requirements that are intended to protect water resources and water quality. These also contribute to open space and floodplain preservation.

Key Concepts

While conservation subdivisions with clustered residential lots that maximize open space are not a new development type in Georgia, a few best practices are highlighted that may encourage more conservation developments:

1. Allow "by right" in single-family residential zoning districts
2. Allow flexibility in lot size requirements where public water/sewer is available, while remaining "density-neutral" (unless density bonuses are allowed)
3. Where sewer is unavailable, and minimum lot size requirements for homes on septic systems prohibit clustered housing, coordinate with EPD to allow either:
   - Dedication of a portion of each homesite adjacent to the protected open space to accommodate drainfields, or
   - A community septic system outside of the protected open space

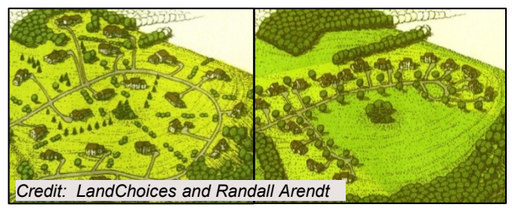


Figure 4-1: Conventional Development vs. Conservation Design

Various models are available to provide guidance for new local ordinances to support open space preservation. The models at right address the standards described above. They have been developed by state and regional agencies for use by Georgia communities. (See list of resources on pages 13 and 14 for more information.)	*Atlanta Regional Commission (ARC) Community Choices Quality Growth Toolkit: Conservation Subdivisions* 1	*Model Conservation Subdivision / Open Space Development Ordinance (Metropolitan North Georgia Water Planning District)* 1	*Coastal Riparian Buffer Ordinance (Georgia Department of Natural Resources, Coastal Resources Division)* 3
	Model Code Part Eight: Special Growth Management Techniques, Section 8-1 Rural Clustering (DCA) 1	*Model Code Part Two: Regulations Implementing Rules for Environmental Planning Criteria (DCA)* 3	*Natural Resources Protection Ordinance (UGA River Basin Center / GA DNR, Coastal Resources Division)* 3
	Model Conservation Subdivision Ordinance (Coastal Georgia Regional Commission) 1	*Stream Buffer Protection Ordinance (Metropolitan North Georgia Water Planning District)* 3	*Wetlands Ordinance for Coastal Counties (Coastal Georgia Regional Development Center)* 3
	Protecting Stream and River Corridors: Creating Effective Local Riparian Buffer Ordinances (Carl Vinson Institute of Government, The University of Georgia) 1 3		

BEST PRACTICES: ***Stormwater Management***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☐ Emergency Services ☑ Structural Project ☐ Public Information

Improve sustainability of stormwater infrastructure needed to reduce runoff:

1 Maintain and enhance existing stormwater management infrastructure.

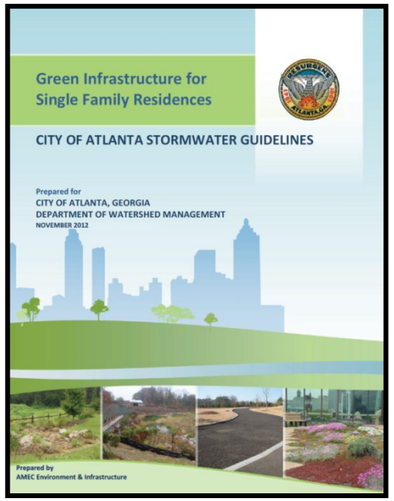
- Maintain surface drainage systems (open channels/culverts and storm drains) to prevent flood damage to properties that otherwise would not flood if the drainage systems remained free of trash, grass clippings, etc.
- Assess and analyze stormwater infrastructure community-wide and develop a Stormwater Management Plan.
- As part of a Stormwater Management Plan, identify green infrastructure retrofits to stormwater infrastructure to address needed improvements. An example is "daylighting" piped streams in park retrofit projects.
- Establish a reliable stormwater infrastructure funding source (e.g. stormwater utility) to implement planned improvements.
- Secure access rights for maintenance of existing and new stormwater management infrastructure.

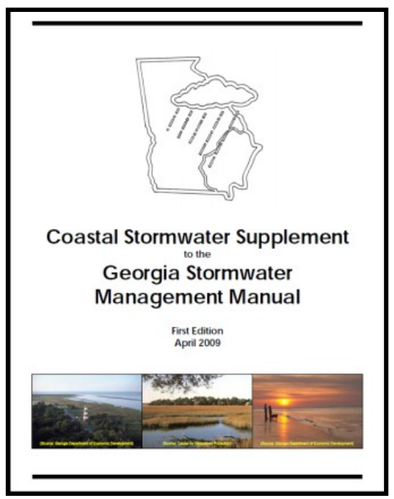
2 Encourage use of green infrastructure practices for new development and redevelopment.

- Use the Comprehensive Plan to establish policies that encourage the use of natural processes to manage stormwater.
- Modify local requirements to remove any barriers to use of green infrastructure practices and encourage or required use of green infrastructure practices in site development.
- Demonstrate green infrastructure practices on public-owned properties such as government offices and parks (new projects or retrofits). Examples include: rain gardens (bioretention), bioswales, permeable paver systems, green roofs, and cisterns.

3 Update development regulations to limit new impervious surfaces.

- Evaluate site design requirements to identify opportunities to reduce stormwater run-off by minimizing new impervious surfaces. Examples of potential modifications to local regulations: reduced roadway widths, cul-de-sac radii, parking space sizes and building setbacks; addition or expansion of parking lot landscaping requirements.





Model green infrastructure sources specific to Georgia communities are available (two examples indicated at right). These sources include guidelines, ordinances and recommendations for practical application at different scales – from large development sites to single-family residential. (See list of resources on pp. 13-14 for more information.)	*Coastal Stormwater Supplement to the Georgia Stormwater Management Manual*
	City of Atlanta Post-Development Stormwater Management Ordinance and Green Infrastructure Guideline

Key Concepts

Conventional stormwater management approaches utilize single-purpose stormwater infrastructure that is meant to convey rainwater through pipes ("grey infrastructure") to streams and rivers. **"Green infrastructure,"** by contrast, uses vegetation and soil to manage rainwater where it falls by enhancing infiltration.

The integration of green infrastructure practices can help reduce the volume of stormwater runoff into a community's storm sewer system and waterways, supplementing existing stormwater infrastructure and reducing the occurrence of flooding. Green infrastructure practices are intended to prevent, rather than manage, increases in stormwater runoff.

Examples of green infrastructure practices:


1. Rain Garden


2. Bioswale


3. Permeable Pavers

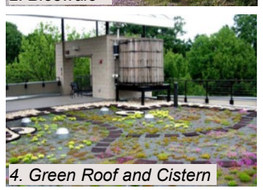

4. Green Roof and Cistern

Photo Credits: 1, 2, and 3 – U.S. Environmental Protection Agency; 4 – City of Atlanta

BEST PRACTICES: ***Community Rating System (CRS)***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☑ Emergency Services ☑ Structural Project ☑ Public Information

Implement CRS Program activities to:

1. **Improve your community's floodplain management program.** FEMA's Community Rating System (CRS) is a voluntary program that helps communities develop better floodplain management programs. The CRS Program involves training local government staff on the latest floodplain regulations and development requirements, promoting inter-departmental understanding of the National Flood Insurance Program (NFIP) and its requirements, designing innovative procedures for record keeping, and helping communities to develop new programs to protect residents from flood damage. *See list of resources on pages 13 and 14 for more information.*

2. **Reduce damage to insurable buildings.** Flood damage to insurable buildings is a costly problem that contributes to the increasing cost of flood insurance. Communities who participate in the CRS Program take advantage of up to 19 floodplain management-related activities which can help prevent damage to insurable buildings. These activities fall under four general categories: Public Information, Mapping and Regulations, Flood Damage Reduction and Flood Preparedness. A community can also take credit for certain activities which are implemented on its behalf by another agency, jurisdiction or state government.

3. **Reduce the cost of flood insurance.** A significant benefit of participating in the CRS program is reducing the cost of flood insurance for local residents and businesses. The more effectively a community works to prevent or reduce flood damage, the cheaper flood insurance will be for its constituents. Each CRS activity is assigned a certain number of credit points. Flood insurance premium reductions begin when a community reaches 500 points, and the amount of premium reduction increases with each additional increment of 500 points (*see Figure 6-1*).

Table 110-1. CRS classes, credit points, and premium discounts.

CRS Class	Credit Points (cT)	Premium Reduction	
		In SFHA	Outside SFHA
1	4,500+	45%	10%
2	4,000–4,499	40%	10%
3	3,500–3,999	35%	10%
4	3,000–3,499	30%	10%
5	2,500–2,999	25%	10%
6	2,000–2,499	20%	10%
7	1,500–1,999	15%	5%
8	1,000–1,499	10%	5%
9	500–999	5%	5%
10	0–499	0	0

SFHA: Zones A, AE, A1–A30, V, V1–V30, AO, and AH

Outside the SFHA: Zones X, B, C, A99, AR, and D

Preferred Risk Policies are not eligible for CRS premium discounts because they already have premiums lower than other policies. Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage.

Some minus-rated policies may not be eligible for CRS premium discounts.

Premium discounts are subject to change.

Source: National Flood Insurance Program, Community Rating System Coordinator's Manual - FIA-15 (FEMA)

Figure 6-1: List of insurance premium reduction levels based on CRS credit points

FEMA High Water Mark Initiative Communities can receive CRS points for "Public Information" activities to reduce the cost of flood insurance. One example is a new FEMA flood risk awareness initiative called "Know Your Line: Be Flood Aware." This program helps communities showcase their local flooding history and motivate residents to take action by posting high water mark signs in prominent places to show how high flood waters have risen in the past. Communities are encouraged to hold a high profile event to announce the initiative, followed by supporting outreach to remind residents of their flood risk over time and prompt them to take steps to reduce it. *See list of resources on pages 13 and 14 for more information.*

Key Concepts

The National Flood Insurance Program **(NFIP)** provides access to federally backed flood insurance protection for property owners in communities that adopt and enforce floodplain regulations *(see also page 1)* to reduce future flood risks to new construction in Special Flood Hazard Areas (**SFHA**).

The basic NFIP requirements provide buildings with minimum levels of flood protection. The **CRS Program** provides incentive (through reduced flood insurance premiums) to implement flood protection measures in 19 floodplain management-related activities that go above and beyond the NFIP minimum requirements.

Goals of the CRS Program are to:

1. *Foster comprehensive floodplain management*
2. *Strengthen and support the insurance aspects of the NFIP*
3. *Rescue and/or avoid damage to insurable buildings*

Benefits include the following:

- ✓ *Money stays in the community*
- ✓ *Insurance savings offset costs of implementation*
- ✓ *Improved flood protection*
- ✓ *Better organized programs*
- ✓ *Ability to evaluate a community against national benchmarks*
- ✓ *Incentives to expand implementation*
- ✓ *Public information builds awareness and support*

BEST PRACTICES: ***High-Wind Resistive Construction***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Adopt DCA Disaster Resilient Construction Appendices to:

1. **Strengthen construction requirements for residential buildings.** Wind speed designations are used to guide the structural design of homes. The mapped wind speeds for some communities decreased with the adoption of the 2012 International Building Code (IBC) and International Residential Code (IRC). To allow communities to maintain or increase to a higher wind speed designation, the Disaster Resilient Construction (DRC) Appendix R (for the IRC) provides four different options for increased wind load. One option includes cost effective techniques for providing a "continuous load path" to transmit wind loads from a building's roof to its foundation. A continuous load path is achieved by using materials and construction methods that help to hold the structure together when high winds try to pull it apart or move it off its foundation (*see Figures 7-1 and 7-2*). Appendix R also includes requirements for: fasteners and connectors used for cladding; fenestration (doors and windows); and roofing. *See list of resources on pages 13 and 14 for more information.*
2. **Strengthen construction requirements for non-residential buildings.** The IBC requires buildings be designed to withstand minimum wind loads and meet opening protection requirements. DRC Appendix N (for the IBC) provides additional wind load options based on the type of building occupancy, its use, and performance levels for achieving collapse prevention, life safety, and immediate occupancy. The options allow a community to address high occupancy buildings and facilities required to remain functional during a high wind event (e.g. hospitals, police and fire stations, 911 call centers, etc.).

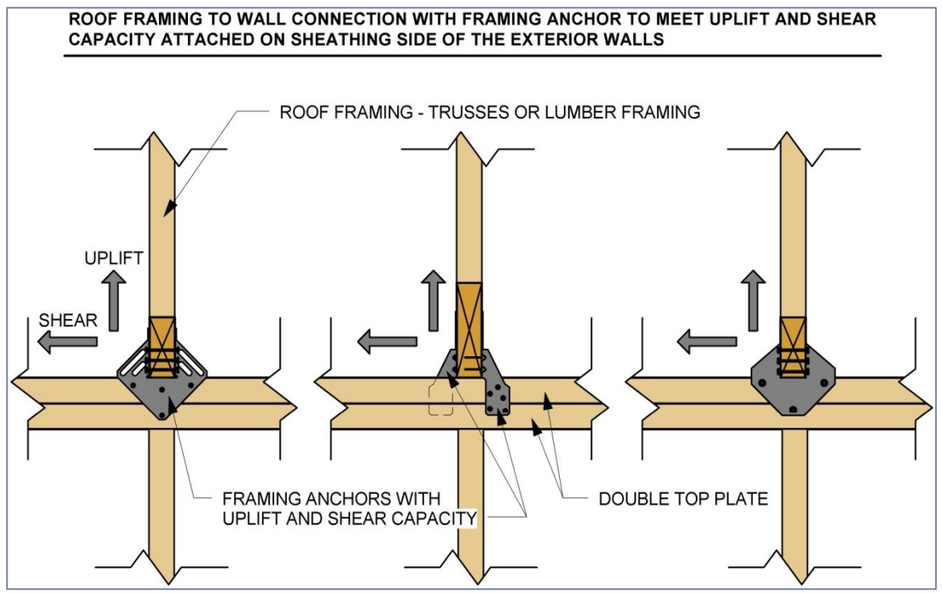


Figure 7-1: Roof Framing to Wall Connection Detail (DRC Appendix R)

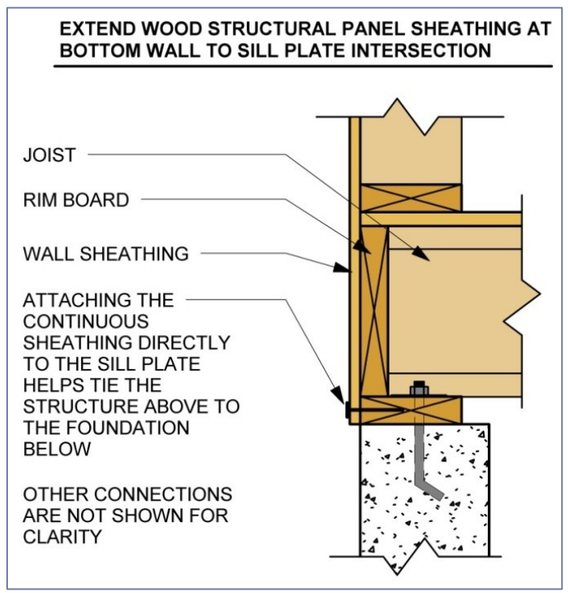
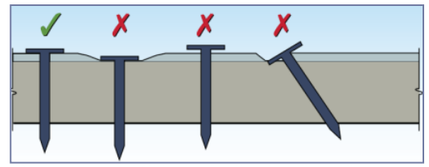


Figure 7-2: Wall Sheathing to Sill Plate Connection Detail (DRC Appendix R)

Key Concepts

Roof Materials

When not securely attached, shingles can be damaged or torn away by high winds. When this happens, the home's interior is vulnerable to rainwater. Displaced shingles can also act as flying debris, potentially causing damage to other structures. The use of nails (vs. staples), the number used and their placement can enhance wind resistance. These factors are addressed in Appendix R (for IRC).



Source: Asphalt Shingle Roofing for High Wind Regions, Technical Fact Sheet No. 7.3 (FEMA)

Figure 7-3: Proper vs. improper asphalt shingle nailing

Roof Form

FEMA studies indicate that wind essentially slides over a multi-sloped "hip" roof, making it better able to withstand high winds than a traditional gable roof. Additional design considerations for resisting wind uplift forces include a 30-degree slope and a roof overhang of less than 20 inches.

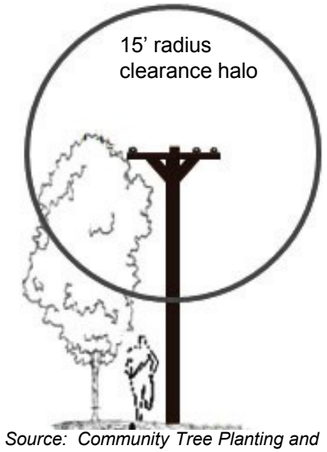
Figure 7-4: Example of a hip roof, which has more slopes than a traditional gable roof

BEST PRACTICES: ***Strategic Tree Selection***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Encourage Strategic Tree Selection and Planting:

1. **Avoid conflicts with above-ground utilities.** In severe storm events, falling trees or tree limbs typically are the cause of damage to above-ground utilities, resulting in dangerous potential for electric shock and power outages to homes and businesses. Strategic selection of tree planting locations can significantly reduce the potential for trees to damage above-ground utilities. Three steps should guide the location of trees in the vicinity of above-ground utilities:
    1. Determine the measurement of half the average mature crown spread of the tree.
    2. Add 15 feet to the measurement. This is the closest to an overhead power line that the tree may be safely planted.
2. **Use local landscape and tree ordinances to encourage planting of wind-resistant tree species.** Many local governments enact and enforce tree ordinances and/or landscape ordinances which include requirements for planting trees in association with new development. These ordinances commonly include lists of recommended tree species. Research and post-storm observations have determined that certain tree species are more wind-resistant than others. Local governments should establish or revise tree ordinances to encourage planting of wind-resistant species, and inform the public of preferred tree species for wind resistance.
3. **Assess community forest storm readiness and identify tree risk mitigation actions.** The Georgia Forestry Commission's *Community Forest Storm Mitigation Planning Workbook* and *Community Forest Mitigation Plan Template* can help a community assess risks to its forest resources (at a minimum, trees on public property and in public rights-of-way) and implement responsive mitigation measures, which could include routine pruning programs, public information activities, and changes to tree ordinances. *See list of resources on pages 13 and 14 for more information*.



Source: Community Tree Planting and Establishment Guidelines (Georgia Forestry Commission)

Figure 8-1: Guidance for avoiding tree and utility conflicts

Credit: AMEC

Figure 8-2: Live Oak

Credit: USDA Forest Service Southern Region

Figure 8-3: Flowering Dogwood

Credit: Jefferson (GA) Heritage Tree Council

Figure 8-4: Yaupon Holly

Key Concepts

Average Mature Crown Spread of a Tree

Often the potential for conflicts with above-ground utilities is not apparent when trees are planted because tree growth is not anticipated. As shown in Figure 8-1, the crown of a tree can easily grow into close proximity to power lines. Estimating the average mature crown spread – the predicted mature size of the tree – can be done in advance of planting with assistance from horticulture references and professionals such as arborists and landscape architects.

Wind-Resistant Tree Species

Several trees with the highest wind resistance* include species that are native** to Georgia:

Medium to Large Trees:

- ✓ American Holly
- ✓ Bald Cypress
- ✓ Cabbage Palm
- ✓ Live Oak (*see Figure 8-2*)
- ✓ Southern Magnolia

Small Trees:

- ✓ Flowering Dogwood (*see Figure 8-3*)
- ✓ Turkey Oak
- ✓ Yaupon Holly *(see Figure 8-4)*

**LSU AgCenter*

*** UGA College of Agricultural and Environmental Sciences (CAES)*

See pages 13 and 14 for additional information.

BEST PRACTICES: ***Sign Resiliency***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Use sign ordinances to improve the ability of signs to withstand high winds:

Provisions can be added to local sign ordinances to improve resiliency of signs. By revising existing sign ordinances (or establishing new sign ordinances) to include these provisions, new signs will be more resistant to damage from high winds in severe storms, and less likely to become wind-borne debris.

1. The International Building Code (IBC) requires buildings to be engineered to withstand minimum wind loads (*see also page 7*). This requirement also applies to signs. A community's sign ordinance can include language to establish appropriate requirements for compliance with the IBC is necessary, such as: "All signs other than temporary signs shall be designed, constructed and maintained in accordance with the International Building Code (IBC)." An expanded approach could more comprehensively address signs by requiring that "all signs hereafter erected, replaced, reconstructed, repaired, altered, relocated or maintained within the jurisdiction" to conform to the requirements of the IBC.
2. Several communities in Georgia take a more tailored approach, requiring structural drawings certified by a professional engineer and a statement indicating conformance with the latest edition of the IBC as part of an application to install a freestanding sign greater than a minimum specified area and height. Some communities further require certification that the wind load design complies with ASCE 7 *Minimum Design Loads For Buildings and Other Structures (see Key Concepts).*
3. Additional standards that may be considered include:
   - Requiring supports and braces to be adequate for wind loadings (e.g. all metal, wire cable supports and braces and all bolts used to attach signs to brackets and to the supporting structure be of galvanized steel or an equivalent corrosion-resistant material);
   - Requiring sign anchoring to prevent any lateral movement that would cause wear on supporting members or connections;
   - Prohibiting suspension of signs by chains or other devices that would allow the sign to swing due to wind action;
   - Extending the structural drawing requirement for freestanding signs in #2 above to any building sign that exceeds a minimum specified size (in square feet).

Figure 9-1: A freestanding sign that is damaged by a high wind can potentially cause damage to surrounding areas.

Key Concepts

American Society of Civil Engineer (**ASCE**) Standards provide technical guidelines and mandatory provisions for all areas of civil engineering. The IBC requires that solid freestanding signs and solid attached signs meet the minimum wind load requirements of **ASCE 7.** The **wind load** is the force acting on a structure due to the pressure of the wind upon it.

Some Georgia communities require certification by a professional engineer that a proposed sign will meet minimum wind load requirements. In *Carroll County*, for example, an engineer must complete and attach a "Certification of Wind-Load Resistance" affidavit as part of the sign permit application for ten feet or higher. *Glynn County* requires certification for signs greater than 20 feet; in *Columbia County* the threshold is 30 feet.

BEST PRACTICES: ***Construction Techniques***

☑ Prevention ☑ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☐ Public Information

Adopt DCA Disaster Resilient Construction Appendices to:

1. **Strengthen construction requirements for residential and commercial buildings.** See *Best Practices: High-Wind Resistive Construction* on page 7.

2. **Provide construction standards for storm shelters, safe rooms and best available refuge areas.** While stronger high-wind resistive construction methods allow buildings to better survive severe storms, in the case of a direct impact from a tornado, a storm shelter, safe room or best available refuge area may be required for survival. Disaster Resilient Construction (DRC) Appendix R (for the IRC) and Appendix N (for the IBC) provide standards for storm shelters and safe rooms (*see Figure 10-1*) when constructed as separate detached buildings or as internal areas within buildings. Appendix R is intended to allow builders to offer residential storm shelters or safe rooms as an optional package that meets applicable IRC and FEMA requirements. Appendix N also provides standards for best available refuge areas and requires new schools (K-12 with 50 or more occupants), 911 call stations, emergency operation centers, and fire, rescue, ambulance, and police stations to have a storm shelter or safe room. *See pages 13 and 14 for more information*.

Figure 10-1: A residential safe room withstands a tornado

Locate Safe Rooms or Storm Shelters in Manufactured Home Parks:

3. **Amend development standards.** Communities that have minimum standards for manufactured home parks (or, "subdivisions" or "developments") in their zoning ordinance or land development regulations can amend the standards to require a community safe room or community storm shelter (*see Figure 10-2*) in accordance with ICC/NSSA and FEMA requirements (*see Key Definitions at right*). While this requirement is the recommended best practice, an alternative is to amend regulations to indicate that construction of a safe room or storm shelter, <u>if</u> undertaken as part of a manufactured home park development, <u>shall</u> be in accordance with applicable ICC/NSSA and FEMA standards. Either approach can be done as a stand-alone amendment or in conjunction with adoption of the relevant DRC section. *See pages 13 and 14 for more information*.

Figure 10-2*: A dome tornado shelter/community center in a manufactured home park

Key Definitions

Storm Shelter

A building, structure or portions thereof, constructed in accordance with International Code Council (ICC) / National Storm Shelter Association (NSSA) 500 *Standard for the Design and Construction of Storm Shelters* and designated for use during a severe wind storm event, such as a tornado or hurricane.

Safe Room

A building, structure or portions thereof, constructed in accordance with FEMA 361 *Design and Construction Guidance for Community Safe Rooms* and designed for use during a severe wind storm event, such as a tornado or hurricane.

Best Available Refuge Areas

Areas in a building (not defined as a safe room or storm shelter) that have been deemed by a registered design professional to likely offer the greatest safety for building occupants during a tornado or hurricane.

* The shelter was constructed using FEMA (75%) and private (25%) funds. Community Development Block Grant (CDBG) funds may also be used to construct tornado-safe shelters in manufactured home parks, in accordance with the Federal Tornado Shelters Act.

BEST PRACTICES: ***Integrated Planning***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☑ Emergency Services ☑ Structural Project ☑ Public Information

Integrate Hazard Mitigation with Comprehensive Planning:

1 Identify gaps in local hazard mitigation planning and comprehensive planning.

- Involve community planners and emergency management specialists in a comparative analysis and review of existing hazard mitigation plan and local comprehensive plan, policies and regulations to identify gaps and/or overlaps.
- Perform a Safe Growth Audit to assess the extent to which existing planning tools address hazard mitigation and community resiliency. Detailed description of the Safe Growth Audit purpose and process is available in Hazard Mitigation: Integrating Best Practices into Planning (published by the American Planning Association) and in Integrating Hazard Mitigation into Local Planning (FEMA). *See list of resources on pages 13 and 14*.

2 Integrate hazard mitigation throughout local comprehensive plans and regional plans.

- Include hazard mitigation and disaster resiliency among the goals and objectives in comprehensive plans and regional plans.
- Include specific provisions for hazard mitigation and disaster resiliency in the various components/elements of the comprehensive plan. For example:
    - Discuss natural hazards and identify critical facilities, infrastructure and utilities in the Needs and Opportunities section
    - Address natural hazards in the future development map/future land use map (e.g. include a floodplain category)
    - Add Hazard Mitigation Plan initiatives and projects to the five-year Community Work Program (CWP) and Capital Improvements Element (CIE)
- Include a hazard mitigation element as a core component of comprehensive plans and regional plans. The hazard mitigation element can incorporate the goals, maps and recommended mitigation actions from the local hazard mitigation plan.
- In the multi-jurisdictional Hazard Mitigation Plan (as typical for most Georgia counties), incorporate elements of existing community plans and require that new plans or plan updates in the participating communities be consistent with the goal and strategies of the Hazard Mitigation Plan. *See Augusta-Richmond County, Georgia example in Figure 13-1 at right*.

3 Link local comprehensive plans and hazard mitigation plans to the regional plan.

- Use the Regional Commission as a forum to discuss multi-jurisdictional approaches to hazard mitigation.
- Include natural hazard areas such as floodplains on the Regionally Important Resources (RIR) map and the "Conservation" category of the Regional Development Map.
- Use the Implementation Program in Regional Plans to provide opportunities to establish policies and performance standards that address identified hazards that are applicable to the communities in the region.
- Include a definition of critical facilities in the Community Facilities and Services section of the Regional Plan that is consistent with that of the region's comprehensive plans, and include policy recommendations to address future critical facility siting and infrastructure expansion in the Guiding Principles section.

Key Concepts

Benefits of integrated planning:

- ✓ *Promotes consistency among plans*
- ✓ *Increases the visibility of hazard mitigation goals, objectives and policies*
- ✓ *Improves coordination between community planners and emergency planners*
- ✓ *Allows planners and officials to manage known hazards with existing planning frameworks, and promotes future development patterns that do not increase risk*
- ✓ *Leads to implementation of projects needed to manage risk, including structural and non-structural (e.g. local code updates) as well as short- and long-term projects*

Plans Incorporated into the Hazard Mitigation Plan	
Plan	Element Incorporated into Hazard Mitigation Plan
Augusta-Richmond County Emergency Operations Plan	All-hazards approach to event response, evacuation, and recovery.
Augusta-Richmond County Comprehensive Plan	Demographic data, land use policies, development trends, short- and long-term work programs, and environmental policies.
Augusta-Richmond County and the Cities of Blythe and Hephzibah Capital Improvement Plans	Stormwater projects.
Building Code Requirements	Hazard area and critical facility construction.
Zoning Ordinances	Flooding hazards and land use.
Subdivision Regulations	Transportation corridors and location of subdivisions in sensitive areas.
Stormwater Management Plan	Public outreach and water-shed education.

Source: Integrating Hazard Mitigation into Local Planning (FEMA)

Figure 11-1: Augusta-Richmond County Hazard Mitigation Plan Integration Summary

BEST PRACTICES: ***Public Outreach and Awareness***

☐ Prevention ☐ Property Protection ☐ Natural Resource Protection ☐ Emergency Services ☐ Structural Project ☑ Public Information

Expand outreach and awareness efforts concerning hazard mitigation, emergency preparedness and safety:

1. **Educate property owners about hazard mitigation and property protection.**
   - Conduct targeted outreach to educate property owners in potential flood prone areas about flood risks and flood mitigation measures to limit property damage and save lives.
   - Use free materials provided by the National Flood Insurance Program (NFIP) to increase awareness of the availability of flood insurance (NFIP). *See Figure 12-2*.
   - Use free materials available from different sources to educate property owners about the benefits of hazard mitigation actions/programs implemented by local government, utilities or other agencies (e.g. tree trimming programs, *see Figure 12-1*).
2. **Inform and educate all citizens about safety measures during and after a storm event.**
   - Consistently communicate the key emergency management concepts such as Watch vs. Warning (*see Figure 12-3*), the meaning of alert sirens, evacuation procedures and routes, and the role of emergency management professionals.
   - Encourage community members to prepare family emergency plans and communication strategies.
   - Communicate to the public using multiple media options, including social media, and in multiple languages as appropriate to the community (*see Figures 12-2* and *12-4*). Education materials should also address specific needs of the elderly, disabled and other vulnerable populations.

Figure 12-1: A public service message promoting proper tree pruning techniques to reduce storm damage (by the U.S. Forest Service and the Washington State Department of Natural Resources).

Figure 12-2: NFIP flood outreach toolkits include flood insurance promotional materials in both English and Spanish.

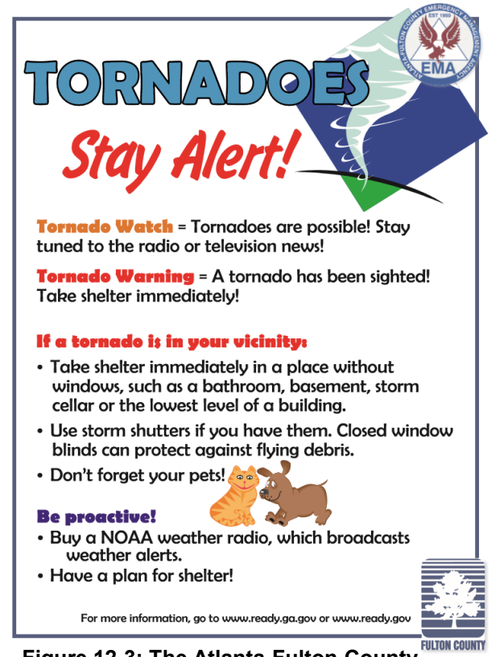


Figure 12-3: The Atlanta-Fulton County EMA webpage posts a series of "Ready Fulton Flyers," available through GEMA's Georgia *Ready* campaign.

Figure 12-4: Like many communities, the Floyd County (GA) EMA webpage provides a link for enrollment in a weather warning system.

FEMA, GEMA, NFIP, the American Red Cross, and the National Oceanic and Atmospheric Administration (NOAA) are key agencies that provide resources to assist with public outreach and awareness efforts. For more information see pages 13 and 14.

BEST PRACTICES: ***Resources***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☑ Emergency Services ☑ Structural ☑ Project ☑ Public Information

Utilize technical resources to assist with planning and implementation efforts:

The resources referenced in this guidebook are provided below and on the next page. The numbers shown correspond to the pages in the guidebook where the resource is cited or discussed:

American Red Cross, 12
www.redcross.org/prepare/disaster-safety-library

Asphalt Shingle Roofing for High Wind Regions, Technical Fact Sheet No. 7.3 (FEMA), 7
www.fema.gov/resource-document-library

ASCE 7: Minimum Design Loads For Buildings and Other Structures (American Institute of Certified Engineers), 9
www.asce.org

Community Choices Quality Growth Toolkit: Conservation Subdivision (Atlanta Regional Commission), 4
www.atlantaregional.com/local-government/implementation-assistance/best-practices

City of Atlanta Post-Development Stormwater Management Ordinance and Green Infrastructure Guideline, 5
www.atlantawatershed.org/greeninfrastructure

Coastal Riparian Buffer Ordinance (UGA River Basin Center/GA DNR, Coastal Resources Division), 4
www.rivercenter.uga.edu/publications.htm

Coastal Stormwater Supplement to the Georgia Stormwater Management Manual, 5
www.georgiastormwater.com

Community Forest Storm Mitigation Planning Workbook and Community Forest Mitigation Plan Template (Georgia Forestry Commission), 8
www.gfc.state.ga.us/community-forests/management/trees-storm-safety

Community Rating System (CRS), 1 and 6
www.fema.gov/national-flood-insurance-program-community-rating-system

Community Tree Planting and Establishment Guidelines (Georgia Forestry Commission), 8
www.gatrees.org/resources/publications

DCA Disaster Resilient Construction Appendices (Appendix N and Appendix R), 2, 7 and 10
www.dca.ga.gov/development/constructioncodes/programs/DRBCWorkshop.asp

FEMA's High Water Mark Initiative, 6 and 12
www.fema.gov/about-high-water-mark-initiative

FEMA's Ready Campaign, 12
www.ready.gov/publications

FEMA Technical Bulletin 2, Flood Damage-Resistant Materials Requirements for Buildings, 2
www.fema.gov/resource-document-library

Key Contacts*

Georgia Department of Community Affairs (DCA)

Best Practices Guidebook
pemd.opqga@dca.ga.gov

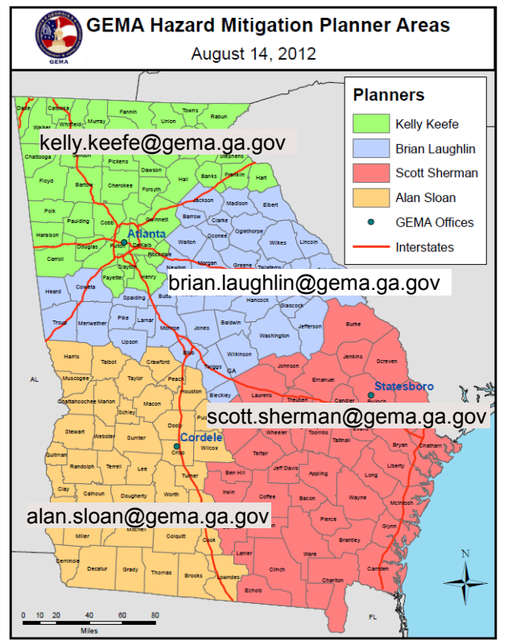
Hazard Mapping
GIS@dca.ga.gov

Disaster Resilient Building Codes
constructioncodes@dca.ga.gov

DCA Office: www.dca.ga.gov
(404) 679-4940 or (800) 359-4663

Georgia Emergency Management Agency (GEMA)

GEMA-HazMitPOC@gema.ga.gov
(404) 635-7522



* *Current as of March, 2014*

BEST PRACTICES: ***Resources (continued)***

☑ Prevention ☑ Property Protection ☑ Natural Resource Protection ☑ Emergency Services ☑ Structural ☑ Project ☑ Public Information

FEMA P-320, Taking Shelter from the Storm: Building a Safe Room for Your Home or Small Business, 10
www.fema.gov/resource-document-library

FEMA P-361, Design and Construction Guidance for Community Safe Rooms, 10
www.fema.gov/resource-document-library

Floodplain Management in Georgia – Quick Guide (GA DNR), 1
www.gaepd.org/Documents/techguide_wpb.html

Floodplain Management in Georgia – Quick Guide (GA DNR), 1
www.gaepd.org/Documents/techguide_wpb.html

GEMA's Georgia Ready Campaign, 12
www.ready.ga.gov/Media/Files/Toolkit/Promoting-Preparedness-in-Your-Community/Localizing-the-Ready-Brand-for-Your-Community

Georgia Forestry Commission, 8
www.gatrees.org

Georgia Stormwater Management Manual ("Blue Book"), 5
www.georgiastormwater.com

HAZUS (Hazards-United States Multi-Hazards), 3
www.fema.gov/hazus

Hazard Mitigation: Integrating Best Practices into Planning (American Planning Association Planning Advisory Service [PAS] Report Number 560, 2010), 11
www.fema.gov/resource-document-library

Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (FEMA, 2013), 11
www.fema.gov/resource-document-library

International Code Council (ICC)/National Storm Shelter Association (NSSA) 500 - Standard for the Design and Construction of Storm Shelters, 10
www.iccsafe.org

LSU AgCenter publication: Make Wise Tree Removal Decisions Before a Hurricane (Hallie Dozier and Steven Wright, 2013), 8
www.lsuagcenter.com

Model Code Part Eight: Special Growth Management Techniques, Section 8-1 Rural Clustering (DCA), 4
www.dca.ga.gov/development/PlanningQualityGrowth/programs/modelcode.asp

Model Code Part Two: Regulations Implementing Rules for Environmental Planning Criteria (DCA), 4
www.dca.ga.gov/development/PlanningQualityGrowth/programs/modelcode.asp

Model Conservation Subdivision Ordinance (Coastal Georgia Regional Commission), 4
www.crc.ga.gov/departments/planning/planning.html

Model Conservation Subdivision/Open Space Development Ordinance (Metropolitan North Georgia Water Planning District), 4
www.northgeorgiawater.org/stormwater/model-ordinances

Model Flood Damage Prevention Ordinance – Coastal Communities (GA DNR), 1
www.georgiadfirm.com/communityoff/commdocs.htm

Model Flood Damage Prevention Ordinance – Riverine Communities (GA DNR), 1
www.georgiadfirm.com/communityoff/commdocs.htm

Model Flood Damage Prevention Ordinance (DCA) – See Model Code Part Three: Section 3-3, 1
www.dca.ga.gov/development/PlanningQualityGrowth/programs/modelcode.asp

Model Floodplain/Flood Damage Prevention Ordinance (Metropolitan North Georgia Water Planning District), 1
www.northgeorgiawater.org/stormwater/model-ordinances

National Flood Insurance Program (NFIP), 1, 6 and 12
www.floodsmart.gov/floodsmart

NFIP Community Rating System (CRS) Coordinator's Manual, 1 and 6
www.fema.gov/resource-document-library

NFIP Flood Outreach Toolkits, 11
www.floodsmart.gov/toolkits/flood/index.htm

National Oceanic and Atmospheric Administration (NOAA) Brochures, 12
www.nws.noaa.gov/om/brochures.shtml

Natural Resources Protection Ordinance (GA DNR, Coastal Resources Division; available on the Coastal Regional Commission website), 4
www.crc.ga.gov/departments/planning/planning.htm

Protecting Stream and River Corridors: Creating Effective Riparian Buffer Ordinances (Carl Vinson Institute of Government, The University of Georgia), 4
www.rivercenter.uga.edu/publications.htm

Stream Buffer Protection Ordinance (Metropolitan North Georgia Water Planning District), 4
www.northgeorgiawater.org/stormwater/model-ordinances

UGA College of Agricultural and Environmental Sciences publication: Native Plants for Georgia Part 1: Trees, Shrubs and Woody Vines (Gary Wade, 2011), 8
www.caes.uga.edu/publications

Wetlands Ordinance for Coastal Counties (Coastal Georgia Regional Development Center), 4
www.crc.ga.gov or 912/437-0800 (contact Planning Services staff)