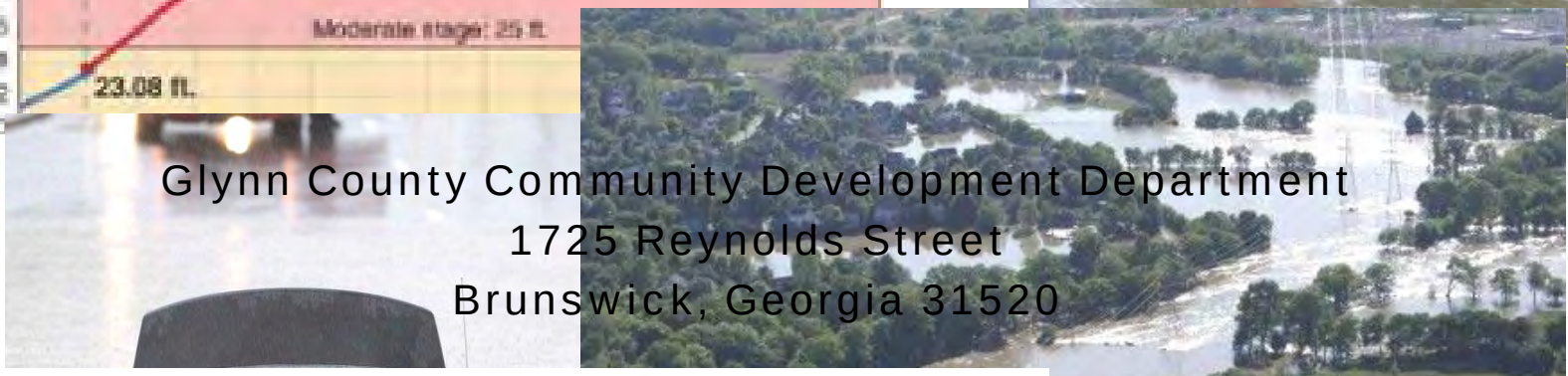
Glynn County Flood Informaton



Glynn County Community Development Department
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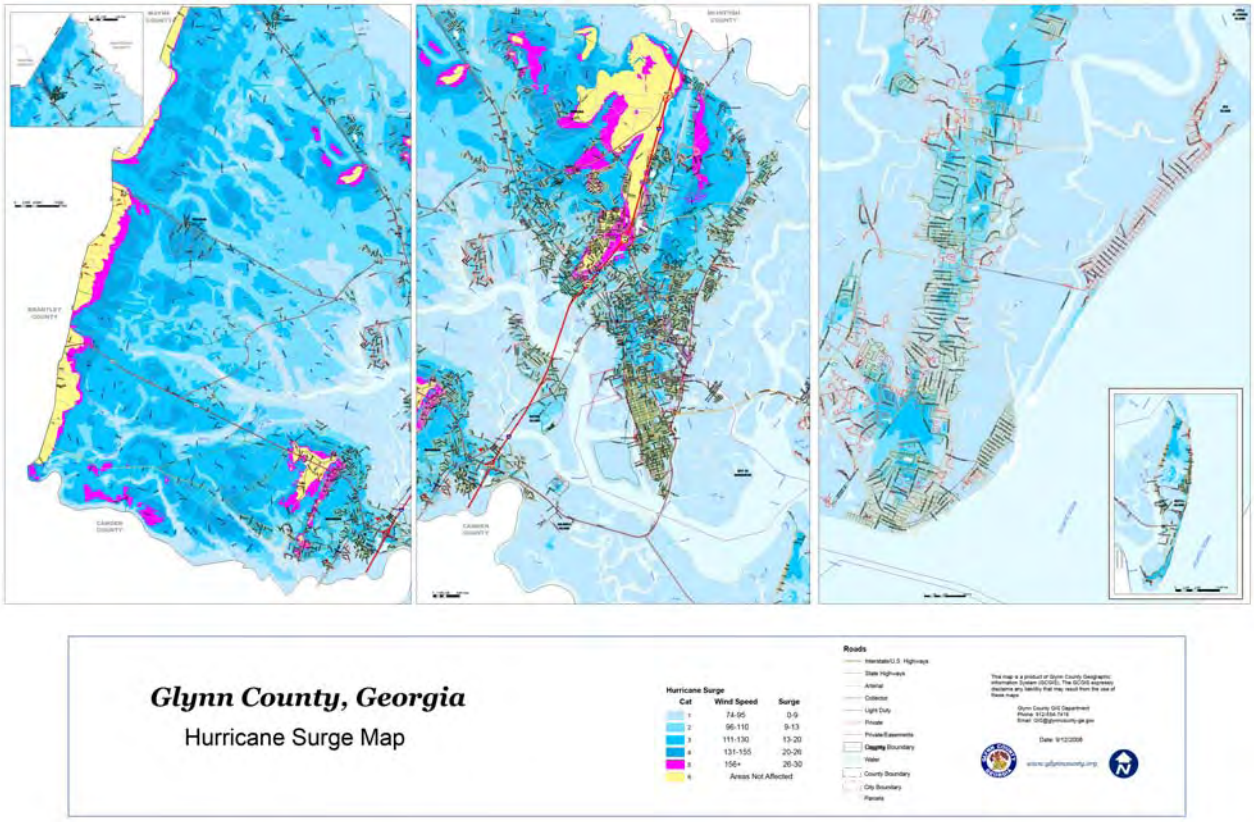
Overview

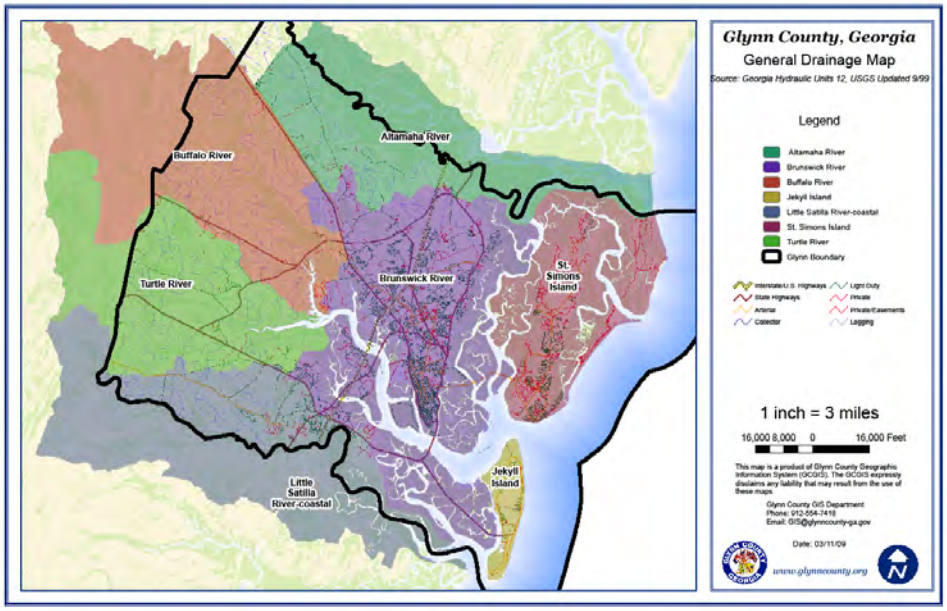
The County has a Floodplain Mitigation Study that is updated on a five year basis to identify and evaluate the potential for flood damage and opportunities to reduce this potential risk throughout the unincorporated areas of Glynn County. This plan update is funded by a grant from the Federal Emergency Management Agency (FEMA) and the results may be used to apply for funding from FEMA for implementing a demonstration mitigation projects identified in the plan. The plan was developed by county staff and citizen volunteers.

The Glynn County Flood Insurance Rate Maps indicate that nearly 97% of the County lies within a special flood hazard area. There is a threat of flooding from both coastal storms the Altamaha and Turtle Rivers.



COUNTY BACKGROUND

The County is one of six coastal counties in Georgia. "Glynn County has three rivers, the Altamaha, the Little Satilla, and the Turtle River. Glynn County's rivers are intimately connected with its marshlands and barrier islands, as marshlands surround most of the river corridors and the rivers add sediment to the marshlands and barrier islands." Glynn County is bounded on the north by the Altamaha River and McIntosh County, on the east by the Atlantic Ocean, on the south by the Little Satilla River and Camden County, and on the west by Brantley and Wayne Counties. The county is comprised of approximately 457 square miles of area (292,480 acres) of which approximately 412 square miles are land area (263,680 acres) comprised of uplands and wetland areas and 45 square miles is water area (28,800 acres).



Glynn County has geography typical of Georgia coastal counties. The coastal area is defined by large areas of wetlands and marsh, with a series of barrier islands beyond. Glynn County is part of Georgia' Coastal Plain. The Coastal Plain consists partly of sediment eroded from the Piedmont over the past 100 million years, and partly from limestone generated by ocean creatures and ocean-related organic processes. As the edge of Georgia's Coastal Plain, Glynn County consists primarily of sands and muds from the Quaternary era, the most recent ice age dating back 1.6 million years.

Barrier islands have been formed by the accretion of beach and dune sands, deposits from nearby rivers, and as a result of stable ocean levels. Like the Glynn County coast, Glynn's barrier islands reflect a series of prehistoric terraces that represent fluctuating primordial seashores. Georgia's barrier islands are relatively short and wide compared to other islands on the Atlantic shoreline. Barrier islands are separated from the mainland by deep tidal inlets as well as salt marsh, tidal creeks, and estuaries. On the Georgia coast, sand generally moves southward, meaning that barrier islands tend to erode at their northern ends and grow at their southern ends.

The major inhabited islands of Glynn County are St. Simons Island, Jekyll Island, and Sea Island and Little St. Simons, the largest being St. Simons Island. Large areas of marshland intercut with the intercoastal waterway lie between the islands and the mainland.

As a coastal county, Glynn County is very flat and drainage can be a problem. Due to its history of gradual formation by the receding of the Atlantic Ocean, Glynn County's soils are primarily sedimentary, composed of sands and muds. Receding ocean levels have resulted in a series of ridges that represent former shorelines at times of higher ocean levels. Thus Glynn County is characterized by a series of gentle ridges running largely parallel to the current shoreline. As a result, the coastal plain has a very gradual slope upwards from the Atlantic coast and little topographical variation. Soils in the county are predominantly sandy on the coastal side of the

county and predominantly clay on the western side of the county". The clay soils in the county drain poorly.

As the amount of development increases, and as lower lying areas are increasingly developed, the threat of flooding increases. Increase development can increase impervious surfaces, and cause places that did not previously flood to be susceptible to flooding. The county engineer's assessment is that the current stormwater system is at capacity in many areas and major rain events could cause significant flooding of residential properties.

Recently Tropical Storm Tammy in 2005 increased awareness of stormwater issues in several Glynn County neighborhoods experienced flooding difficulties. One area of particular concern is the bowl-shaped area west of I-95 and east of SR341. The quality of drainage facilities in the western areas of the county has not been ascertained. Drainage facilities in the western areas of the county were created by the US Department of Agriculture in the early 1940's for draining forest lands. These old ditches are proving to be inadequate to drain modern-day residential development.

St. Simons Island also has some stormwater drainage issues, but less so than the mainland. Although St. Simons Island is mostly developed, significant redevelopment is occurring on the island, often increasing the amount of impervious surfaces. Stormwater drainage and flooding could be exacerbated by this increasing redevelopment, especially considering the difficulty and expense of adding additional stormwater drainage facilities on the island. However, steady maintenance of existing stormwater facilities is the response to worsening stormwater Issues. On the positive side, Glynn County has several potential drainage destinations, with the Altamaha River to the north, and the Little Satilla and the Turtle Rivers to the south.

Susceptibility to flooding is dependent upon several different variables. Among those are topography, ground saturation, previous rainfall amounts, soil types, drainage basin size, drainage patterns, and vegetative cover. Most floods occur because the ground is already saturated with moisture and cannot absorb any further runoff.

In most years, flooding accounts for or is involved with three quarters of Federal Disaster declarations. Floods generally claim about 140 lives each year, making them one of the US's most deadly kinds of weather. They are also responsible for more damage to property each year than any other type of weather hazard. Glynn County is susceptible to several types of flooding: riverine floods, coastal floods, tidal floods and urban floods. River floods and coastal floods in Glynn County may occur concurrently with coastal storms/hurricanes. Glynn County's FIRM Base Map depicting the region's various flood zones is located online through the GIS portal. The following is a listing of previous flooding occurrences over the last fifteen years.

Flood – August 1995; 0 injuries; property damage: $25.0K (Hurricane Jerry produced countywide flooding; L Street and Hwy 341 impassable)
Flood – September 1995; Brunswick; 0 injuries; property damage: $5.0K (intersections of L and Stonewall, Bartow and Stonewall closed)
Flash flood – October 1996; Brunswick; 0 injuries; property damage: $12.0K (5-7' heavy rain from

nor'easter and Tropical Storm Josephine)
Flood – March 1998; 0 injuries; property damage: $3.5M (El Nino flooding, 200 homes damaged, flooding along St. Marys, Altamaha, and Satilla Rivers)
Flood – July 1998; Brunswick; 0 injuries; property damage: $5.0K (portions of Beachview Street and Sea Gate Subdivision closed)
Flood – June 2001; countywide, no data (many secondary roads flooded)
Flood – October 2005 – 9.33 inches of rain and property damage from Tropical Storm Tammy
Flood – April 2009 unknown damage total to structures and infrastructure in western Glynn County due to flooding from Altamaha River.
Flood – August 2009 approximately 7 inches of rain and unspecified property damage from thunderstorm.
Flood – September 2009 approximately 7 inches of rain and unspecified property damage from thunderstorm.

Nearly half of Glynn County's residential and commercial structures valued at nearly seven billion dollars are lying in areas of potential danger in the event of flooding. Considering past flooding events in this region, there is 66.67**%** chance that a flood will occur during any given year. This means that approximately every 1.5 years areas in Glynn County will flood.

Glynn County has a Stormwater Ordinance which was effective by allowing no greater than pre-development runoff and it requires that water quality be improved by catching and filtering water. Land owners must also maintain their stormwater filters to ensure their continued effectiveness.

In the long run, more effective measure may be necessary to prevent increased] flooding. The county is planning to develop a stormwater master plan which would create a comprehensive drainage and stormwater treatment plan for the county. Even with a stormwater master plan developed, acquiring the lengthy rights of way from developed areas to the drainage destinations is an expensive and time consuming proposal.

The majority of the new development will occur west of I-95 which removes it from the flooding associated with tidal events. This area remains susceptible to localized, riverine and hurricane flooding. Given that the area is currently scarcely developed it may be possible through targeted drainage improvements, clustered development and utilizing wetlands as containment areas to reduce the flooding potential of future development.

Understanding the Potential

The first element to examine is the base flood--a statistical concept that considers both the likelihood and severity of a flood. The base flood is also known as the often misunderstood 100-year flood or by the technical term, 1% chance flood. People may have heard the term 100-year-flood in relation to a recent flood and think they've seen the worst that nature can dish out. The term base flood is a better term because it forms the basis for planning and does not imply that this is a rare event.

Event	Probability that Event will be Equaled or Exceeded in a 30-year Period
10-year (10% annual chance)	96%
25-year (4% annual chance)	71%
50-year (2% annual chance)	45%

100-year (1% annual chance)	26%
500-year (0.2% annual chance)	6%

Source FEMA

Potential Property damage in Category 3 Hurricane (Full Assessed Valuation Shown)

	# In Hazard Area	Percent in Hazard Area	Value
Residential	27,522	86%	$8,688,668,311
Commercial	2,134	72%	$1,342,691,115
Industrial	132	100%	$103,414,045
Agriculture	27	75%	$514,180
Government	488	100%	$444,945,270
	30,171		$10,580,232,921.00

Potential Property damage in Potential Flood Areas (Full Assessed Valuation Shown)

	# In Hazard Area	Percent in Hazard Area	Value
Residential	13,104	41%	$5,643,485,574
Commercial	1,144	39%	$779,640,845
Industrial	74	56%	$36,750,636
Agriculture	28	78%	$289,226
Government	305	63%	$393,610,543
	14,655		$6,853,487,598.00

Flood Insurance

Glynn County participates in the National Flood Insurance Program; therefore, flood insurance is available to the residents of the County. Under the NFIP, insurance is available to properties regardless of their proximity to a special flood hazard area.

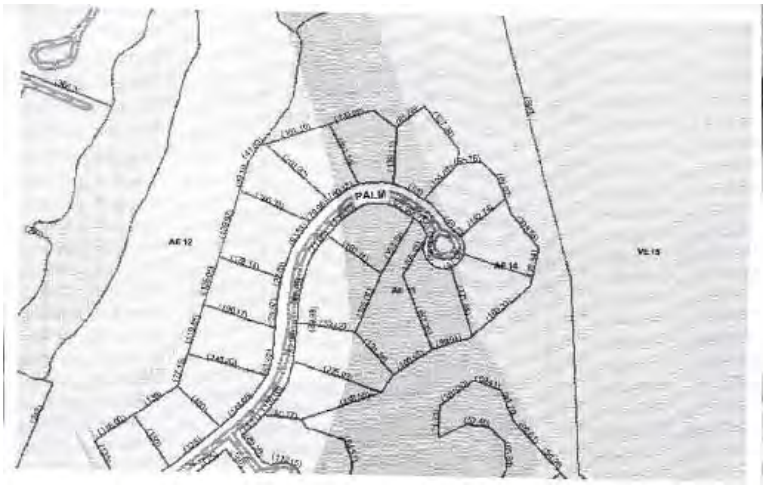
While flood insurance does not protect the structure from physical damage, it can reduce the impact of flood loses on the ability of the individual and the community to financially recover from the event. Insurance premiums are based on the amount of coverage and the flooding risk. Approximately 25% of all flood insurance claims are from structures located outside of the 100-year floodplain.

The Flood Insurance Rate Map (FIRM), which shows the base floodplain as mapped by FEMA. It identifies the flood hazard area that the County must regulate under the NFIP and that lenders and insurance agents use in determining who must purchase flood insurance and how much a policy costs. In other words, the NFIP has already designated the geography that our planning must address.

FEMA is particularly concerned about repetitive losses--two or more flood insurance claims for more than $1,000 for the same structure over a 10-year period. Such buildings represent fewer than 2% of the flood insurance policy base, but over one third of claims payments. Glynn County currently has nineteen repetitive loss locations throughout the county. Additionally the

county has identified forty-three structures that have suffered flood loss claims at least once in the last ten years. They may indicate a one- time occurrence that represents an isolated event that has been corrected or when merged with the multi-event locations provide a better scale into an existing or predictor of a developing flooding condition.

The National Flood Insurance Program (NFIP) is a federal program operated by FEMA to make flood insurance available to property owners who might not otherwise be able to buy it. NFIP flood insurance is written by private insurance companies and is available through most agents, but the coverages and the rates are set by FEMA. For residents to be able to purchase NFIP flood insurance, the County must participate in NFIP. To participate, the County must meet NFIP's minimum standards, which include adopting and enforcing floodplain zoning regulations.



Partial FIRM showing multiple zones in a small area.

In 1990, NFIP introduced its Community Rating System (CRS). The idea is that if the County took steps to reduce the risk of flood damage in the community which go beyond NFIP's minimum requirements, that community's residents should pay less for flood insurance because of the reduced risk.

The potential premium savings can be substantial in a county with a good CRS grade. In a county like Glynn where a substantial number of property owners purchase flood insurance, it makes sense for the County to invest that time and effort in view of the potential savings for residents. There are specific requirements the County must meet to qualify for specific CRS grades.

Communities participating in the National Flood Insurance Program are permitted to create their own flood damage prevention ordinance, so long as the ordinance meets certain minimum standards. Higher standards are encouraged by FEMA and may be credited under the Community Rating System.

The original Flood Insurance Rate Maps for Glynn County, Georgia became effective on April 15, 1985. The current effective FIRM Index is dated September 6, 2006. Map Revisions were prepared to the original maps on the following dates.

- February 2, 1989: Changed special flood hazard areas, base flood elevations, and zone designations.
- October 16, 1992: Incorporated Coastal Barrier Resource System areas and/or otherwise protected areas.
- April 4, 1994: Corrected road locations.
- July 17, 1995: Modified Coastal Barrier Resource System units.
- September 6, 2006: Modified base flood elevation data

There are no pending Letters of Map Revision (LOMR) filed with the County.

Glynn County has an appeals process to address complaints about enforcement of provisions of the flood insurance program primarily elevation requirements. The appeals committee consists of the County Administrator, County Engineer and Community Development Director. There have been no appeals heard by this body in the last ten years, although the Building Official has brought numerous enforcement actions against violators, who have all made the necessary corrections.

MITIGATION STRATEGIES

There are numerous potential mitigation techniques that may be appropriate to limit flood damage. All techniques may not be appropriate to any given location and there may be locations where only one technique may be recommended.

Prevention Techniques

- **Planning and Zoning Requirements**

  The Future Land Use map has land use classifications depict how Glynn County is recommended to develop. Based on the land use classifications, zoning districts with specific uses further guide and regulate where and how the county develops. Other regulations and ordinances, such as the flood damage prevention ordinance, are based on the plan. Glynn County regulates the amount and type of development occurring in riverine floodplain areas. Development in a floodplain area disturbs existing drainage patterns and may increase the speed and volume of floodwater downstream. Floodplains are frequently environmentally sensitive in other aspects, such as stream buffers or wetlands Building cannot occur in regulatory wetlands and certain other sensitive areas.

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  Because the floodplain for Glynn County incorporates the tropical storm surge, potential developable areas may be designated as within a flood zone but structures are elevated above a specified flood elevation depicted on the FIRMs. This practice is typical for coastal communities and differs from inland communities with riverine flooding.

- **Open Space Preservation**

  Maintaining flood hazard areas as open space by restriction or acquisition is a widely utilized means of limiting/preventing flood damage. Critical areas where the amount of runoff needs to be limited to reduce the flooding potential and which should be set aside as open space should be identified for later acquisition or preservation.

  Criteria to be considered when selecting areas to acquire for preservation should include, but not be limited to, the potential for flood damage reduction, the potential for development, impact on storm water management and maintenance, and the impact on the tax base.

- **Flood Ordinance Requirements**

  The Glynn County Flood Damage Prevention Ordinance sets forth requirements for development of the floodplain. These requirements establish minimum elevations for the first floor of structures and other criteria. Different flood zones (A, V, AE, VE, etc.) have different requirements for construction. Even along the same street, as demonstrated below, there may be different zones in a very short distance that may add to some confusion over requirements.

- **Stormwater Management and Erosion Control**

  Development of previously "greenfield sites", whether in or out of the floodplain, will increase the potential for flooding by increasing the imperviousness of a site and thereby increasing the potential rate and amount of stormwater discharge. Without stormwater management, this increase in runoff may cause areas previously unaffected by flooding to become flooded and flood depths to increase in other areas.

  Bioswale

  Glynn County requires new development projects to maintain runoff from their site to pre-development rates through the construction of detention basins. In general, this is a good practice; however, consideration should also be given to where the site is situated within the riverine watershed with respect to the ultimate discharge into the receiving river. It may be more appropriate in the lower sub-basins of the watershed for new sites to be permitted to discharge at a more rapid rate thereby allowing that channel capacity to be available for more remote portions of the basin. Other measures can also be taken to reduce the amount of runoff from new development. These measures may include, use of swales, raingardens, bioswales, filter strips, green space requirements, and use of permeable paving materials.

- **Wetlands Protection**

  Wetlands provide some storage for stormwater and serve to lessen the impact of flooding on downstream stream areas. Regulatory wetlands are provided protection from development by the US Army Corps of Engineers under Section 404 of the Clean Water

Act. A permit is required for development that impacts wetlands. The first test of the need to impact the wetlands is; is the impact necessary and is it minimized. When impacts are not avoidable the Corps may allow for the purchase of credits in a mitigation bank or by the applicant by preserving or developing wetlands on another part of the development site or at an alternative site. Wetland mitigation may be appropriate provided that flooding concerns associated with the wetland impacts are given proper consideration in the plan.

- **Drainage System Maintenance**

Drainage systems are designed to a specified storm size event to provide a level of protection when maintained in proper condition. Systems that are not maintained on a regular basis may become clogged resulting in a loss of carrying and storage capacity. Typically, clogs occur at bends in ditches and canals, at bridge and culvert openings, and in systems constructed with a minimum slope. Debris in channels may be caused by natural events or by dumping of lawn debris, appliances and other waste in the drainage system.

To minimize the amount of debris accumulation in the drainage system a combination of public education, regulation and a maintenance system are utilized. The public is made aware of the impact of dumping lawn clippings and other materials in the drainage system. The County Public Works Department conducts periodic inspections of channels, and remove debris as needed. The semiannual maintenance schedule is located on the department's webpage.

- **Channel Improvements**

Improving the carrying capacity of a channel by increasing its width, depth, configuration or smoothness can reduce flooding. The current environmental philosophy is not to design banks that are devoid of woody and major herbaceous vegetation, as has been

Typical current channel

Vegetated channel

the past design and maintenance practice but to incorporate selective vegetation into the design to absorb/trap water borne pollutants. This may require a widening of the channel over the prior typical design. The capacity of downstream culverts, bridges and ditches must be considered so as not to increase flooding downstream of the proposed improvements or improvements to these structures must be incorporated in the improvement plans. Channel modifications are a common and efficient flood reduction technique.

Advantages and Disadvantages of Channel Improvements

Advantages	Disadvantages
• The home and the area around it will be protected from inundation, and no significant changes to the home will be required. • Floodwaters to the limit of the design storm cannot reach the house or other structures in the protected area and therefore will not cause damage through inundation, hydrodynamic pressure, erosion, scour or debris impact. • The house can be occupied during construction of channel improvements. • Channel improvements can reduce the physical, financial, and emotional strain that accompanies flood events.	• Channel improvements may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Channel improvements may require extensive studies and permitting. • Cost may be high. • Periodic maintenance is required. • If not coordinated, local drainage can be affected, possibly creating or worsening flood problems for others. • A large area may be required for channel improvement construction.

- **Storm Sewers**

Storm sewer improvements can be effective in reducing flooding in localized areas. Storm sewers are often used in constricted areas to obtain increased flow rates. Caution should be used when designing a storm sewer upgrade to insure that flooding is not increased upstream, by the creation of a backwater pool, or downstream of the project area by channel scouring resulting from the increased flow velocities. Typical projects may include upgrading existing culverts and pipes, improving discharging and receiving ditches, and redirecting flows from impervious areas to new systems.

Floodgates may also be considered part of the stormwater management system and, when operated properly, can be an effective management tool. Maintenance and environmental concerns should be taken into account when considering the installation and use of floodgates.

Advantages and Disadvantages of Storm Sewer Improvements

Advantages	Disadvantages
• The home and the area around it will be protected from inundation to the design storm size, and no changes to the home will be required. • Floodwaters to the limit of the design storm cannot reach the house or other structures in the protected area and therefore will not cause damage through inundation, hydrodynamic pressure, erosion, scour or debris impact. • The house can be occupied during construction of the storm sewer improvements. • Storm sewer improvements can reduce the physical, financial, and emotional strain that accompanies flood events.	• Storm sewer improvements may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Storm sewer improvements may require extensive studies and permitting. • Cost may be high and may require a countywide stormwater assessment to fund. • Periodic maintenance is required. • If not coordinated, local drainage can be affected, possibly creating or worsening flood problems for others. • Storm sewer improvements by themselves do not reduce flood insurance rates. • A large area may be required for storm sewer improvement construction.

- **Dune and Beach Management**

Effective dune and beach management protect property from flooding by providing wide beaches and healthy sand dunes. These items act as a barrier between the ocean and buildings from coastal storms. Regulation and regular maintenance can enhance the effectiveness of these important natural features.

Dunes are protected from vehicular and pedestrian traffic. Clearly identified paths, boardwalks and stairs direct traffic away from critical areas. Planting vegetation can enhance existing dunes and help create new ones. Sand fences can also be installed to create new dunes.

Most of the primary dune on St. Simons Island was lost in a storm in Hurricane Dora in 1964 and the decision was made to install a hardened barrier known as the Johnson

Rocks. This mechanism works to some extent though erosion continues to undermine the base and over sweep erodes the back of the barrier. No new natural dune creation has occurred from the time the barrier rocks were installed. There have been numerous isolated permitted attempts to reestablish the primary dune through use of manmade biodegradable sand bags and sand tubes incorporating native vegetation. Sea Island has been more successful in maintaining the primary dune and beach area by installation of a groin towards the southern end of the island.

Emergency Services

- **Flood Warning Systems and Evacuation Routes**

Advance warning of flood conditions allows people to take precautions in protecting their property and can provide for an orderly evacuation. Glynn County has developed a flood warning system for areas within the floodplains. Warnings will be disseminated by radio (WGIG AM 1440, WMOG AM 1490, WPIQ AM 790, WFGA FM 103.3, WHFX FM 92.7, WBGA FM 102.5, WGCO FM 98.3, WSEG FM 104, WMK.FM 105.9, WYNR FM 107.7, TV Channel 21 WSBG, weather radio and by police and fire vehicles equipped with public address systems. The Flood warning system in Glynn County is intended to provide 24 hour advance warning of a flood hazard. However, high intensity storms that produce localized and riverine flooding may not allow for sufficient warning.

FLOOD WARNING means that flash flooding is possible within the watch area.

FLASH FLOOD WARNING means that flash flooding is imminent or has been reported in the warning area.

Designated evacuation routes are shown in the local telephone book. These routes include US 17 South, US 341, US 32 and US 82.

Advantages and Disadvantages of Flood Warning Systems

Advantages	Disadvantages
• This system can provide warning to residences of the potential or actual need to evacuate their home. • Early warning can potentially limit damage to structures content by providing sufficient time to move the contents to a higher elevation within the house or to a remote location.	• There needs to be a tremendous amount of storm and drainage basin modeling done to develop a system that is reliable and does not send out false notifications. • This system needs to be tied into the Code Red or other warning system through some undetermined method which may take some time to perfect.

• The house can be occupied during construction of the flood warning system. • A flood warning system can be very cost effective in providing notice of flood events and thereby reducing damages. • Flood warning systems improvements can reduce the physical, financial, and emotional strain that accompanies flood events.	• Periodic reevaluation of the system is required. • Flood warning systems by themselves do not reduce flood insurance rates.

- **Emergency Services Protection and Flood Safety**

Property protection and personal safety is enhanced by the ability of emergency services personnel to respond quickly during and immediately after a flood event. In order for this to happen, emergency services equipment and facilities must be protected. Fire, police, medical and emergency operations facilities should be located above expected flood elevations. It is critical that the emergency management operations center be located in the county in a position of safety.

As a resident of unincorporated Glynn County, you should be concerned about the flood hazard in your area. There are several actions you can take to reduce the flood hazard including:

1). Know the flood warning procedure;
2). Plan escape routes to higher grounds;
3). Turn off the gas and electricity;
4) Monitor the level of water in the waterways if possible during time of heavy rainfall. Stay tuned to radio and TV for possible flood warnings;
5) Evacuate the flood hazard area in times of impending flood or when advised to do so by the police or fire department;
6). Do not attempt to cross a flooded stream on foot or by car;
7). If your car stalls in high water, abandon it immediately and seek higher ground,
8). Keep children away from flood waters, ditches, and storm drains;
9). Be especially cautious at night.

Advantages and Disadvantages of Emergency Services Protection

Advantages	Disadvantages
• This is all pre-storm activity and can be planned as time and budget permits. • Houses subject to flooding potential can be occupied during this planning.	• The effectiveness of this planning can only be evaluated during and after a storm event. • Emergency services protection improvements may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance.

	• Cost may be high. • Periodic maintenance of emergency equipment is required. • Emergency services planning by itself may give some residents a false sense that it is ok to remain in an area.

- **Flood Response and Disaster Recovery & Mitigation Planning**

  Glynn County views pre-flood planning for response and recovery activities is critical to insuring a speedy and efficient recovery. Key local industries and critical facilities are worked with to develop response and recovery plans in place. Post event sites and projects have been identified and prioritized. Glynn County has an annual hurricane preparedness tabletop exercise which in part deals with the effects of a hurricane surge which is the ultimate coastal flooding event. Additionally the County has done GIS mapping showing various storm events with the anticipated flooding limits and number of properties involved.

Advantages and Disadvantages of Flood Response and Disaster Recovery & Mitigation Planning

Advantages	Disadvantages
• This is all pre-storm activity and can be planned as time and budget permits. • Houses subject to flooding potential can be occupied during this planning.	• The effectiveness of this planning can only be evaluated during and after a storm event. • Flood Response and Disaster Recovery & Mitigation Planning may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Periodic updating Flood Response and Disaster Recovery & Mitigation Planning is required.

Public Education

- **Risk Information**

  Risk information is typically in the form of the Flood Insurance Rate Maps (FIRMs) and other means of locating and describing areas prone to localized flooding. For the public to make intelligent decisions about where and how to construct their homes in regards to flood damage prevention, it is necessary to have accurate flood data. The Glynn County Flood Insurance Rate Maps are current and appear to accurately reflect the flood hazard.

Advantages and Disadvantages of Risk Information

Advantages	Disadvantages
• This is typically preconstruction planning which can be very cost effective in making decisions between lots or at what elevation to construct the base floor. • Houses subject to flooding potential can be made more flood resistant by proper planning.	• The effectiveness of this planning can only be evaluated during and after a storm event. • Risk Information may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Periodic updating of the Flood Insurance Rate Maps is required.

- **Outreach Projects**

  Glynn County uses outreach projects to educate the public about flood hazards and flood damage prevention techniques. Printed and electronic materials are distributed to residents through a number of venues. Glynn County Community Development Department has created and run "Hurricane Awareness" commercials during the Planning Commissions and Board of Commissioners public meetings.

Advantages and Disadvantages of Outreach Projects

Advantages	Disadvantages
• This is all pre-storm activity and can be planned as time and budget permits. • Houses subject to flooding potential can be occupied during this activity. • This is a relatively a low cost activity.	• The effectiveness of this planning can only be evaluated during and after a storm event. • Outreach projects may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Periodic updating of outreach projects is required to keep the information fresh.

- **Real Estate Disclosure**

  Federally regulated lending institutions are required to inform potential buyers that the property they are purchasing is in a special flood hazard area and that flood insurance will be required. This requirement must be met ten (10) days prior to closing. With the current lending rules, applicants are potentially committed to the purchase before learning about the flood hazard and the requirement to purchase flood insurance.

  The Board of Realtors has informed members of the availability of the flood information on the county's web site in an effort to assist buyers in making informed purchase

decisions. Real estate professionals who are informed by the current owner must disclose past flooding problems associated with a property regardless of its proximity to a floodplain.

Advantages and Disadvantages of Real Estate Disclosure

Advantages	Disadvantages
• This is all pre-storm activity and is done by non-county staff that can have a legal responsibility to disclose the information. • People can make informed decisions about houses subject to flooding potential.	• The effectiveness of this disclosure can only be evaluated based upon statements after a storm event. • Real Estate disclosure may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance

- **Technical Assistance**

Glynn County Building Inspections Division offers information to homeowners who may be willing to undertake flood protection measures to an existing building if made aware that such techniques are available and if provided with information on how to construct or install them or want to know how to comply on new construction.

The Division that maintains a resource library that in addition to the latest FIRMs contains the following reference materials:

- FEMA - Homeowners Guide to Retrofitting
- FEMA - Above the Flood
- FEMA – Protecting Building Utilities From Flood Damage
- FEMA – Coastal Construction Manual Volumes 1-3
- FEMA – Answers to Questions About the NFIP
- FEMA – Flood Insurance Requirements for Recipients of Federal Disaster Assistance
- FEMA - Public Assistance Policy Digest
- FEMA - Mandatory Purchase of Flood Insurance Guidelines
- FEMA - Increased Cost of Compliance Coverage
- FEMA – Reducing Damage from Localized Flooding
- FEMA – Floodproofing Non-Residential Structures
- NFPI – Managing Your Flood Insurance Claim
- American Red Cross – Repairing Your Flooded Home

The County's data system is electronic from mapping through building permitting and no Certificate of Occupancy can be issued for a building that requires a flood elevation certification. Additionally the County has established and maintains mapping of National Geodetic Surveys monuments on a County web page an incorporated the FIRM data has been into the County's GIS system. Each new building or substantial improvement is required to have an elevation certificate filled before final inspections are performed. These elevations have been maintained by the division since the mid 1990's and are available to the public, realtors or insurance agents.

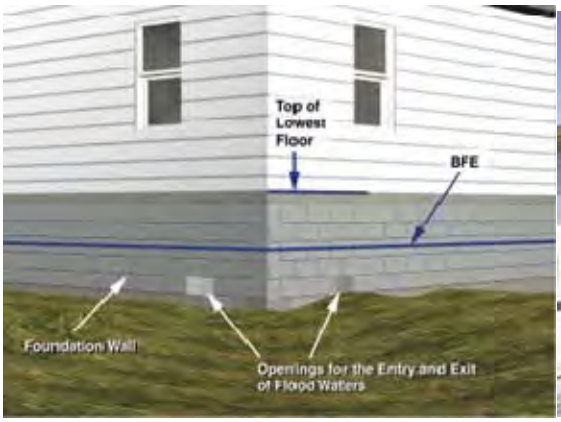
Advantages and Disadvantages of Technical Assistance

Advantages	Disadvantages
• This is all pre-storm activity and can be planned as time and budget	• The effectiveness of this planning can only be evaluated after a storm event.

permits. • Houses subject to flooding potential can be occupied during planning.	• Technical assistance may not be used to bring a substantially improved or substantially damaged home into compliance with the county's floodplain management ordinance. • Periodic updating of the technical assistance information is required as techniques and standards change. .

New Building Requirements

All new construction within Glynn County requires a building permit. This includes the placement of manufactured homes (mobile homes). If located within a flood zone, they must have an Elevation Certificate prepared a registered surveyor. Elevation certificates are used as evidence that the building complies with the NFIP rules. Major renovations/retrofits that exceed 50% of the valuation of the structure also require new certificates and may be required to elevate the existing building to comply with the current elevation requirements. The most common method of construction is to elevate the structure above the base flood elevation by either constructing a floodable crawl space or structural fill within a footing as shown below.



Retrofitting Techniques

- **Elevation**

Elevation of new structures and substantially damaged or substantially improved structures is a requirement of the Glynn County flood damage prevention ordinance. Elevation is also an effective mitigation strategy for other flood prone homes. Modern house raising techniques make this a technically viable option for most homes.

Attaching to a slab.

After the lift.

In floodplains with shallow flood depths (2 —4 feet), homes can be raised to the required elevation and placed on a continuous perimeter foundation to provide protection. In areas with deeper flooding depths and in flood zones V and VE, it may be necessary to raise the structure further and to place the home on piers, pilings or posts. In this case, the area under the home may be used for parking, access and limited storage.

Approximate Square Foot Costs of Elevating a Home (2009 Dollars)

Construction Type	**Existing Foundation**	**Retrofit**	**Cost** (per square foot of house footprint)
Frame (for frame house with brick veneer add 10%)	Crawlspace	Elevate 2 Feet on Continuous Foundation Walls or Open Foundation	$29
		Elevate 4 Feet on Continuous Foundation Walls or Open Foundation	$32
		Elevate 8 Feet on Continuous Foundation Walls or Open Foundation	$37
	Slab on Grade	Elevate 2 Feet on Continuous Foundation Walls or Open Foundation	$80
		Elevate 4 Feet on Continuous Foundation Walls or Open Foundation	$83
		Elevate 8 Feet on Continuous Foundation Walls or Open Foundation	$88
Masonry	Crawlspace	Elevate 2 Feet on Continuous Foundation Walls or Open Foundation	$60
		Elevate 4 Feet on Continuous Foundation Walls or Open Foundation	$63
		Elevate 8 Feet on Continuous Foundation Walls or Open Foundation	$68
	Slab on Grade	Elevate 2 Feet on Continuous Foundation Walls or Open Foundation	$88
		Elevate 4 Feet on Continuous Foundation Walls or Open Foundation	$91
		Elevate 8 Feet on Continuous Foundation Walls or Open Foundation	$96

Prices for slab on grade include raising the slab. **Source FEMA**

Advantages and Disadvantages of Elevation

Advantages	Disadvantages
• Elevation to or above BFE allows a substantially improved or substantially damaged home to be brought into compliance with the county's floodplain management ordinance. • Elevation reduces the flood risk to the structure and its contents. • Except where the lower enclosed area is used for storage, elevation eliminates the need to move vulnerable contents to areas above the water level during flooding. • Elevation often reduces flood insurance premiums. • Elevation techniques are well known and local contractors can accomplish some of the elevation methods. • Elevation does not require the purchase of a new location for the residence. • Elevation reduces the physical, financial and emotional strain that accompanies floods.	• Cost can be high. • Appearance of the home may be affected. • Access to the home may be affected. • The home must not be occupied during the flood. • Unless special measures are taken in the design and construction, elevation is not appropriate in areas with high velocity flows, waves, fast moving debris or erosion. • Additional costs are likely if the home is required to be brought into compliance with current codes for electrical, mechanical and plumbing systems.

Source FEMA

- **Relocation**

House moving techniques are available for most homes and are an effective technique for protecting a home subject to flood damage. Relocation has been used effectively throughout the country as a flood damage mitigation technique from a few houses to entire communities.

The cost of relocation can be high, depending on the size, shape, weight of the house and its construction type and the distance of the relocation. Consideration must be given to the cost of the existing structure, relocation costs and repair costs to the structure at the new location when evaluating this alternative. Relocation may be financed through federal loans and grants. Glynn County has never mandated that a structure be relocated to address flood issues.

Advantages and Disadvantages of Relocation

Advantages	Disadvantages
• Relocation allows a substantially improved or damaged home to be brought into compliance with the county's floodplain management ordinance. • Relocation can either eliminate the need to purchase flood insurance or reduce the amount of the premium and significantly reduce flood risk to the structure and its contents.. • Relocation techniques are well known and qualified local contractors are available to relocate the structure. • Relocation can reduce the physical, financial and emotional strain that accompanies flood events.	• Cost can be significant. • A new site, preferably outside the flood hazard area, must be located and purchased. • The flood prone lot must be sold or otherwise disposed of if not part of a relocation package. • Additional costs may be incurred to bring the structure into compliance with current codes for plumbing, electrical and mechanical systems.

Source FEMA

Approximate Costs of Relocation (2009 Dollars)

Construction Type	Foundation Type	Costs (per square foot of house footprint)
Frame (for frame house with brick veneer add 10 percent)	Crawlspace	$58
	Slab on Grade	$99
Masonry	Crawlspace	$67
	Slab on Grade	$116

Prices include site cleanup but do not include new property acquisition cost. **Source FEMA.**

- **Demolition**

Demolition is similar to relocation in that structures are permanently removed from flood hazard areas. In this case, however, the existing home is demolished rather than relocated. This technique may be more appropriate than relocation for structures that are too expensive to relocate or that are in a "substandard" condition. Some owners have evaluated the cost of elevating an existing structure and opted for demolition to allow for an entirely new structure. Glynn County has never mandated that a structure be demolished to address flood issues. However, numerous non- permitted additions and modifications to existing structures have been required to be removed.

.Advantages and Disadvantages of Demolition

Advantages	Disadvantages

• Demolition removes a damaged home and allows the site to be brought into compliance with the county's floodplain management ordinance. • Demolition will decrease runoff from the site. • Demolition would enable the site to be used for open space or potentially for stormwater detention. • Demolition of the current residence and acquisition of another property can reduce the physical, financial and emotional strain that accompanies flood events.	• Cost can be significant. • A new residence, preferably outside the flood hazard area, must be located and purchased. • The flood prone lot must be bought to be used for open space or stormwater detention and site improvements may be required.

- **Floodproofing**

There are several methods of providing floodproofing to structures that cannot be removed from the floodplain. Barriers can be constructed around a building; the building can be dry floodproofed or wet floodproofed. Typically, these methods are most suitable in areas where flood depths are not expected to exceed 2 - 3 feet, where flood velocities will remain low, and where there is short flood duration.

Barriers such as levees, dikes and floodwalls can effectively keep floodwaters away from a structure, but there also problems inherent to this technique. The protected structure may be inaccessible to emergency personnel and may still be unusable until floodwaters recede. Flood barriers often provide homeowners with a false sense of security and make evacuation less appealing. Maintenance and operation of the barrier is also a consideration. If the barrier is breached or overtopped the result is ponded water with no means of natural drainage.

Temporary flood barrier

Dry floodproofing keeps water from entering or damaging the structure, but is only effective in shallow depths. Many dry floodproofing techniques require human intervention, such as the placement of door and window shields and, therefore, may not be an effective option for structures occupied on a temporary or periodic basis.

Advantages and Disadvantages of Dry Floodproofing

Advantages	Disadvantages
• Dry floodproofing reduces the flood risk to the home and its contents. • Dry floodproofing may be less costly	• Dry floodproofing may not be used to bring a substantially improved or substantially damaged home into compliance with the county's

than other retrofitting methods. • Dry floodproofing does not require the additional land that may be needed for levees and floodwalls. • Dry floodproofing reduces the physical, financial and emotional strain that accompanies floods.	floodplain management ordinance. • Ongoing maintenance is required. • Flood insurance premiums are not reduced for dry floodproofed residential structures. • Installing temporary protective measures requires property owner action and sufficient warning time. • If the protective measures fail or the BFE is exceeded, the effect on the home will be the same or worse than if there were no protection at all. • If design loads are exceeded, walls may buckle, and the home may even float, potentially resulting in more damage than if the home were allowed to flood. • The home must not be occupied during a flood. • Waterproofing materials and flood shields may not be aesthetically pleasing. • Shields and sealants may leak, which could result in damage to the home and its contents. • Dry floodproofing does not minimize the potential damage from high velocity flood flow and wave action. • Adequate warning time is required to close any openings.

Source FEMA

Wet floodproofing (flood resistance) is primarily used for non-residential structures. This technique allows water to enter the structure, but elevates and otherwise protects the contents of the structure from damage and uses flood resistant materials in the construction of the interior. Garages that are below the flood elevation are floodproofed with integral venting to permit the passage of floodwaters.

Advantages and Disadvantages of Wet Floodproofing

Advantages	Disadvantages
• No matter how small the effort, wet floodproofing can, in many instances reduces the flood damage to a home and	• Periodic maintenance may be required.

its contents. • Because wet floodproofing reduces the risks of structural collapse as hydrostatic pressures are allowed to equalize, the loads on walls and floors will be less than in a dry floodproofed home. • Wet floodproofing measures are often less costly than other types of retrofitting. • Wet floodproofing does not require the additional land that may be needed for levees and floodwalls. • The appearance of the home is usually not adversely affected. • Wet floodproofing reduces the physical, financial and emotional strain that accompanies floods.	• Preparing the home and its Installing temporary protective measures requires property owner action and sufficient warning time. • The home must not be occupied during a flood and it may be uninhabitable for sometime afterward. • Wet floodproofing does not minimize the potential damage from high velocity flood flow and wave action. • The home will get wet inside and possibly be contaminated by sewage, chemicals and other materials borne by floodwaters. Extensive cleanup may be necessary.

Source FEMA

Relative Costs of Various Retrofit Measures

Construction Type	Existing Foundation	Measure	Retrofit	Relative Cost
Frame, Masonry Veneer or Masonry	Crawlspace	Wet Floodproofing 	Wet floodproof crawlspace to a height of 4 feet above lowest adjacent ground elevation	Lowest
Masonry Veneer or Masonry	Slab on Grade or Crawlspace	Dry Floodproofing 	Dry floodproof to a maximum height of 3 feet above lowest adjacent ground elevation	
Frame, Masonry Veneer or Masonry	Crawlspace or open foundation	Elevation 	Elevate on continuous foundation walls or open foundation	
Frame, Masonry Veneer or Masonry	Crawlspace or open foundation	Relocation 	Elevate on continuous foundation walls or open foundation	
Frame, Masonry Veneer or Masonry	Slab on Grade	Elevation 	Elevate on continuous foundation walls or open foundation	

Frame, Masonry Veneer or Masonry	Slab on Grade	Relocation 	Elevate on continuous foundation walls or open foundation	Highest
Frame, Masonry Veneer or Masonry	Slab on Grade, crawlspace or open foundation	Demolition 	Demolish existing building and buying or building a home elsewhere	Varies

Source FEMA