CHAPTER 1 – INTRODUCTION TO HAZARD MITIGATION

Section I **Purpose and Authority**

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Below you will find a summary of updates to Chapter 1 of this plan. In many of the chapters, imbedded links can be found to quickly reference a source.

Chapter 1 Section	Updates to Section
I. Purpose & need of the plan, authority, & stated problem	• Includes information regarding sanction of federal and state regulations
II. Local methodology, brief description of plan update process, & update participants	• Section updated to include list of participants and enhanced public notification procedures.
III. Description of how the original plan was reviewed, analyzed, & if revised	• Section updated with regard to plan development process.
IV. Organization of the plan	• Slight text additions and revisions.
V. Local Hazard, Risk, and Vulnerability (HRV) summary, local mitigation goals and objectives	• Data added to address disaster events occurring since 2004 plan, and changes to the list of hazards more probable to occur.
VI. Multi-Jurisdictional special considerations (for special needs populations)	• Updated to include multi-jurisdictional resources and conditions
VII. Adoption, implementation, monitoring and evaluation (a general description)	• No changes
VIII. Community Data	• Updated to include current information.

Section I – Purpose and Authority

The purpose of the Bryan County Hazard Mitigation Plan Update is to work toward a safer, and more post-hazard resilient community for Bryan County residents and work force by reducing the potential for disaster caused damages upon life and property. This endeavor will be accomplished by creating a planning document that becomes the foundation for Emergency Management planning, training and preparedness, and by identifying those hazard mitigation projects that are capable of reducing the negative consequences of hazardous events within Bryan County. This Multi-Jurisdictional Hazard Mitigation Plan Update will meet the requirements of the Disaster Mitigation Act of 2000 Public Law 106-390, October 30, 2000, as stipulated in the Interim Final Rule 44 CFR 201.4 Standard State Plan criteria, published on February 26, 2002. Meeting the regulations will allow Bryan County to maintain eligibility and qualify to secure all federally declared disaster assistance, including certain types of Public Assistance and Hazard Mitigation Grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288, as amended).

The Disaster Mitigation Act of 2000 (DMA 2000)

In the past, Federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. DMA 2000 is the latest legislation to improve the planning aspect of that process. The Act reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. The Act establishes a pre-disaster hazard mitigation program and designates new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act identifies the new requirements for planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive mitigation plan prior to disaster.

State and Federal regulations and requirements for the Multi-Jurisdictional Hazard Mitigation Plan Update have been refined, and some added to enhance the data sources.

State and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to, and the capabilities of, the individual communities. Failure to meet the new criteria will make state and local governments ineligible for Stafford Assistance, and thus forfeit some types of emergency assistance. The same applies to timely, state and federally required and approved plan updates.

Section II - Planning Methodology

Development of the Bryan County Hazard Mitigation Plan was a concerted effort on the part of Bryan County and the Cities of Pembroke and Richmond Hill, all of whose participation and input were solicited, and were represented by various members

throughout the planning process. By proclamation, the Bryan County Board of Commissioners approved the following scope of work for the development of the plan:

- Agendas, sign-in sheets, and minutes were kept at each committee meeting. Minutes recorded the voting process for significant steps.
- Facilitated, regular committee meetings to review Hazard, Risk and Vulnerability (HRV) assessment data and formulate mitigation actions based on collected assessments and local capabilities.
- Citizens were encouraged to follow the progress of the update process and provide feedback through several methodologies.
- Advertised public meetings at least twice during the planning process with a public review of the draft plan scheduled.

The Bryan County Multi-Jurisdictional Hazard Mitigation Plan Update Committee held two public meetings, the first being the Georgia Emergency Management Agency (GEMA) led Kick-off meeting on May 16th, 2017, and the second at a scheduled meeting on January 29th, 2019. There were no significant public comments or concerns at either meeting; therefore, there was not a need to consider or incorporate public comments in the plan review.

The Bryan County Joint Comprehensive Plan, Local Emergency Operations Plan, the Bryan County 2016 Codes and Ordinances, and current Bryan County Hazard Mitigation Plan were reviewed for incorporation into the Bryan County Hazard Mitigation Plan Update. Portions of the Bryan County Joint Comprehensive Plan were reviewed to develop the general land use patterns and development trends for Bryan County.

The local Emergency Management Agency Director (who served as Chairman of the Bryan County Hazard Mitigation Plan Update Committee) and the planning consultants were responsible for data gathering, regular oversight, planning, and coordination of plan development together with their GEMA Planner (Shelby Meyers), who provided consultation and plan continuation services.

Public input was considered critical to the success of the plan update and was solicited at every stage of plan development. Committee members solicited input from neighbors, friends, church members, neighboring counties' departments, and coworkers. Meeting minutes were distributed to city and county elected officials, as well as reviewed and approved at subsequent meetings.

Plan Update Methodology

The Bryan County Hazard Mitigation Plan Update Committee was comprised of committee members (see sign-in sheets in Appendix E), and represented all of the Bryan County jurisdictions. The updates to this plan were formed through regular meetings, e-mail correspondence, appointments with county officials, and per phone. As draft Chapter updates became available, they were posted on the online Bryan County Website's Emergency Management page for review and input from the citizenry.
For the first public plan update meeting, (the 5/16/2017 Kick-off Meeting) the public was informed through invitations and notice in their local newspaper (found in Appendix E) and their GEMA representative gave a presentation, and accepted all questions and concerns. The meeting was somewhat well attended and productive.

The second public update meeting was announced to the public through the same local organ. These public notices can be found in Appendix E.

With revisions or corrections incorporated, the plan was readied for GEMA then Federal Emergency Management Agency (FEMA) approval.

Section III - Plan Organization

The Bryan County Hazard Mitigation Plan Update is organized in a fashion to assist local government officials, county residents, public and private sector organizations, and any other interested parties/stakeholders in participating in, and planning for, natural hazards. The Plan Update contains a Hazard, Risk and Vulnerability (HRV) assessment, a section on seven natural hazards that typically occur within the county and a section identifying specific mitigation goals, and related courses of action desired. Finally, a framework for plan implementation and maintenance is presented.

The plan describes those hazards that are considered to have the highest probability of occurrence in relation to their historical background, vulnerability, potential loss, and frequency of occurrence. The plan also identifies and prioritizes hazard mitigation opportunities in each vulnerable area based on input from Plan Update Committee members, various government agencies, local businesses, and Bryan County citizens.

No update for hazardous materials/spills, or terrorism was required nor addressed. With regard to the other previously chosen hazards; coastal erosion, vector borne disease, and water contamination have no new data to include, and were eliminated from the hazard list by the update committee on September 30th, 2009.

For the current (2019) plan update process, several additional planning documents were reviewed and successfully incorporated, including the Bryan County Flood Study of March, 2009, 2017 UGA Extension website, the Bryan County 2018 Comprehensive Plan Update, the 2017 Consolidated Tax Digest, and the 2017 Updated Georgia Mitigation Plan.

The Committee members were asked to assist in collecting updated information and presenting data to the rest of the committee. Each chapter of the prior approved plan was reviewed with updated hazard, risk, and vulnerability data, as well as previous accomplishments of mitigation strategy efforts. Regular meetings of the Plan Update Committee were held, as well as keeping participants informed through e-mail and per phone calls.

Section IV - Hazard, Risk and Vulnerability Assessment

A local risk assessment was accomplished by compiling data on the hazards that have or could affect Bryan County, and then assessing the community's vulnerability to these hazards. The Bryan County Hazard Mitigation Plan Update Committee accomplished the risk assessment by conducting the following steps:

(1) Hazard Identification

(2) Hazard Event Profiling

(3) Vulnerability Assessment

(4) Potential Loss Estimates

(1) Hazard Identification: Maps and historical data sources were studied and reviewed in order to identify the geographic extent, intensity, and probability of occurrence for various hazard events.

The Bryan County Hazard Mitigation Plan Update addresses the following seven hazards considered by committee members to pose the most threat to the residents, property and economy of Bryan County:
• Coastal Storms • Drought • Flooding • Hurricanes/Tropical Storms • Tornadoes • Wildfires • Windstorms

(2) Hazard Event Profiling: Past hazard event data were collected through an extensive process that utilized input from Bryan County Committee members, research on past disaster declarations in the County, information provided from the National Climatic Data Center and the National Weather Service, a review of current Flood Insurance Rate Maps (FIRM), internet and newspaper data searches, interviews with residents, HAZUS data, as well as interviews with GEMA, and Federal, State and local agencies.

The committee analyzed the causes and characteristics of each hazard, how the hazard had affected Bryan County in the past, and what part of Bryan County's population and

infrastructure had historically been vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in *Chapter 2*.

(3) Vulnerability Assessment: The asset inventory component of the HRV assessment data included the development of a database that provides county infrastructure and critical facilities data as well as estimated structure dollar values for loss estimates. This critical facilities database was developed by the EMA office, GEMA, local citizens, and the tax assessor's office. Information collected includes structure location, value, and facility type.

A critical facility, for the purposes of this plan, is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response and/or disaster recovery functions. A dynamic list of Critical facilities in the County was identified by the committee, and prior listings were updated. Vulnerable populations were identified as those in day care facilities, schools, long-term care facilities, and other special healthcare facilities.

A community's vulnerability can be described in terms of the assets located within the extent of a hazard event and the potential losses if such an event occurs. Therefore, the vulnerability assessment was accomplished by comparing each previously identified hazard with the inventory of affected critical facilities and population exposed to each hazard. Bryan County critical facilities reports are located in the Appendix A Data.

Assessing vulnerability, for the purposes of this plan, also included a review of the Bryan County Joint Comprehensive Plan Update 2018 to assess general land use patterns and development trends. This update can be found in Appendix B.

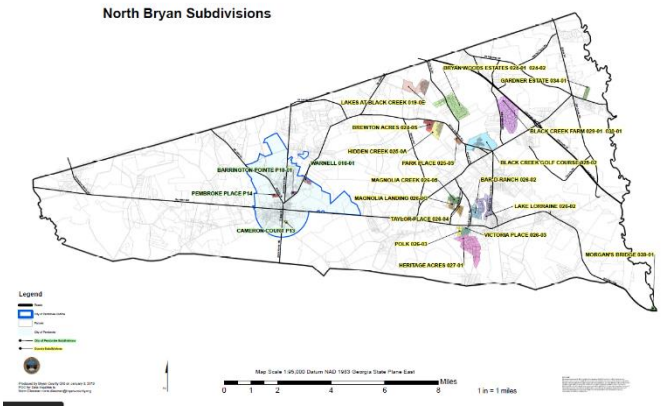
(4) Potential Loss Estimates: Using the best available data and mathematical modeling, estimated damages and financial losses likely to be sustained in a geographic area during a hazard event were calculated. Describing vulnerability in terms of dollar losses provides the county with a common framework in which to measure the effects of hazards on critical facilities.

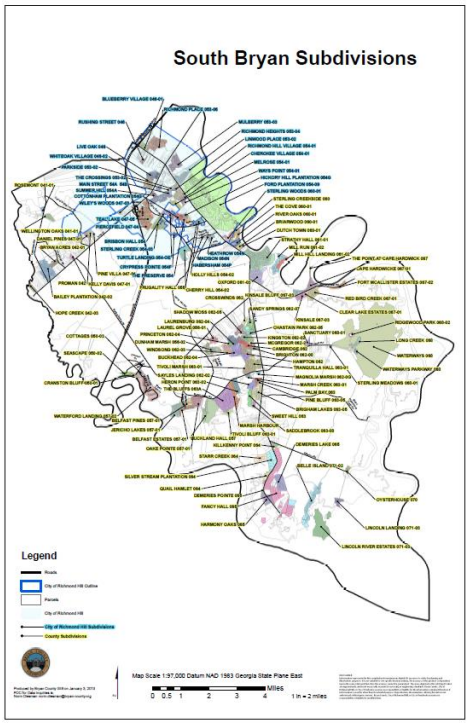
The number and type of structures in the County have been determined for potential loss estimations. The main source of the information was the County Tax Assessor's Office. This, and additional information can be found in Appendix B.

Section V - Mitigation Goals & Objectives

The Bryan County Hazard Mitigation Plan Update Committee used the results of the Hazard, Risk and Vulnerability assessment to identify and prioritize appropriate mitigation goals, and feasible related actions. The Committee identified many mitigation strategies they felt would benefit the community. Development of these strategies began in a committee meeting; and continued with communications with Bryan County citizenry throughout the process.
After ensuring that all interested persons had been given ample opportunity to contribute to strategy development from the many subdivisions on out to rural areas, mitigation

action steps were next given priority status by committee members. To evaluate priorities, committee members considered social, technical, administrative, political, legal, economic, and environmental criteria. Each mitigation strategy step was evaluated to identify those steps offering the best offer of maximum possible protection for Bryan County. Each of the steps was ranked as high priority, medium priority, or low priority. Past occurrences of disasters and historical trend data aided committee members in assigning priorities while economic constraints were weighed in a realistic manner.





Section VI – Multi-Jurisdictional Considerations

The Cities of Pembroke and Richmond Hill, and Bryan County were active participants in the planning process. Mitigation goals and action items identified in this Bryan County plan update are equally applicable to the Cities of Pembroke and Richmond Hill unless specifically noted otherwise.

The city of Pembroke has devised a Canal Greenway Initiative (Article seen in Appendix B) which will aid in many concerns. Cleaning the 20 miles of canals will do well to assist the draining of excess rainfall from residential properties, while eliminating much standing water which will discourage vector borne disease secondary to mosquito breeding, and molds, etc. Once the canals have been cleared, they hope to begin "putting in some walkways."

Section VII - Plan Implementation & Maintenance

Upon final approval by GEMA and FEMA Region IV, the Bryan County Board of Commissioners will be responsible for formally adopting the Bryan County Hazard Mitigation Plan.

After formal adoption of the Bryan County Hazard Mitigation Plan Update, the County Commissioners and City Councils will keep in consideration the Priority Task List and oversee the implementation of said tasks using branches of city and county government when appropriate.

Bryan County currently utilizes comprehensive land use planning, and building codes to guide and control development in the county. After adoption of this Hazard Mitigation Plan Update, these existing mechanisms, when amended, will have hazard mitigation strategies integrated into their revisions. In addition, the Commission and City Councils will require that the local authorities responsible for the previous plans listed, along with the Local Emergency Operations Plan (LEOP) and other multi-jurisdictional plans utilize guidance from this Multi-Jurisdictional Hazard Mitigation Plan Update.

Bryan County has developed a method to ensure that regular review and update of the Plan occurs. The Emergency Management Agency Director will assemble, in every fifth year, and after any major hazard event, a Hazard Mitigation Plan Review Committee. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies set forth in Chapter Three of the Plan Update. The committee will review each goal and action item to determine relevance to changing situations in the County, as well as changes in state and federal policy and to ensure that goals are addressing current and expected conditions. The committee will also review the risk assessment portion of the Plan to determine if this information should be updated or modified. Amendments to this plan will be formalized, submitted and approved by local, state, and federals agencies as designated below.

The parties responsible for the various implementation actions, as assigned by the County Commission and City Councils, will provide a project status report and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised.

The County Commission and City Councils will review recommendations of the committee in every plan review year. County Commissioners and City Council members will evaluate and update the Plan to ensure mitigation action steps are being implemented and that existing programs are utilizing the risk assessment and mitigation strategy as applicable provided by the Hazard Mitigation Plan Update in updates to their Comprehensive Plan and Local Emergency Operations Plan. The EMA Director will then forward any changes to GEMA's Hazard Mitigation Planning Specialist.

Bryan County is dedicated to involving the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. The Plan Review Committee is responsible for

the review and update of the Plan. Although they will represent the public to some extent, the public will be able to directly comment on and provide feedback about the Plan.

Copies of the Plan will be available at the Bryan County Courthouse, Public Library, at the local EMA office, and a digital copy will reside on the Bryan County web site to replace: http://www.bryancountyga.org/departments/emergency_services/hazardous_mitigation_plan.php. The existence and location of these copies will be published in the local newspaper and on all Public Notice bulletin boards. All comments and questions will be directed to the local EMA office for follow-up. The publicly declared County Commission meeting to evaluate and update the Plan will provide the public a forum for which they can express concerns, opinions, or ideas about the plan update.

Section VIII – Adoption by Local Government

Bryan County and the cities of Pembroke and Richmond Hill may adopt the Hazard Mitigation Plan Update 2019 prior to submission to GEMA and FEMA for approval. If not previously adopted, the jurisdictions will adopt by Resolution after FEMA approval. It is the intent of the Bryan County Board of Commissioners to submit this plan to Georgia Emergency Management Agency (GEMA) and Federal Emergency Management Agency (FEMA) Region IV for approval. Upon final approval by GEMA and FEMA Region IV, the Bryan County Board of Commissioners and the governing bodies for the Cities of Pembroke and Richmond Hill will formally adopt the Bryan County Hazard Mitigation Plan 2019 Update, and submit adoption resolutions to GEMA and FEMA. Bryan County has the Plan Update available on-line for review and comment. The County has scheduled the Plan to be Approved and Adopted at the County Commission's next meeting.

CHAPTER 2 – NATURAL HAZARD RISK AND VULNERABILITY (HRV) SUMMARY

The Hazard, Risk, and Vulnerability assessments of the Bryan County Hazard Mitigation Plan Update 2019 provide the scientifically sound foundation for the goals and actions steps which are proposed in this plan update. Bryan County has its Board of Commissioners overseeing county taxes, ordinances, and priorities with regard to performing the action steps for mitigating damages from natural hazards. The cities of Pembroke and Richmond Hill each have their say through their city councils to co-ordinate with Bryan County in these efforts.

The Bryan County Hazard Mitigation 2019 Plan Update Committee reviewed those hazards initially identified as most likely to cause damages and losses to the county and its cities. The original FEMA Worksheets #1 (see Appendix D – Identify the Hazards) and the Worksheet #2 (see Appendix D – Profile Hazard Events) were reviewed along with the updated hazard event data: 2017 populated Worksheet #1, and Hazard Frequency Table (HFT). Hazards that had occurred since the previous update) were collected on a current HFT (see Appendix D), and reviewed alongside the tables from the originally approved

plan. **The first update planning committee determined that eleven natural hazards studied for the 2005 plan could be reduced to eight hazards. The original plan studied the following hazards: Coastal storms, coastal erosion, drought, flooding, hurricanes, severe winter storms, tornados, thunderstorm winds, water contamination issues, and vector-borne diseases. Committee members chose to remove coastal erosion (as there has been no history of aggregate loss from erosion), severe winter storms, water contamination (which is now addressed under flood), and vector borne diseases from the list of hazards due to lack of events in the years following the plan approval. The committee members added hailstorms as the recorded frequency of these events had increased.*

Overview of updates to Chapter 2: Local Natural Hazard, Risk and Vulnerability (HRV)

The Georgia Emergency Management Agency defines hazard, risk, vulnerability, and mitigation as: "A hazard is a potential threat or actual event that impacts a population, infrastructure, or environment."

Risk is a quantifiable probability of a specific hazard event actually occurring. This probability is typically based on hazard history profile-driven statistical modeling. Risk is as temporally and spatially variable as hazard events. The risk of a flood is defined in terms of types of flood plains (100-year, 500-year) while the risk of drought is non-spatial and spans the entire State of Georgia. Calculating the risk of a hazard proves difficult at times because of the absolute dependency on data availability and accuracy as well as reliable statistical modeling.

Chapter 2 Section	**Updates to Section**
I. Water Hazards: Coastal Storms, Drought, Flooding, Storm Surge/high surf	• Data added concerning Hurricanes Matthew & Michael and Tropical Storm Irma • Drought data reviewed • Flooding data reviewed • Storm Surge and high surf added
II. Wind Hazards: Coastal Storms, Thunderstorm Wind, and Tornadoes	• Data added concerning Hurricane Matthew and Tropical Storm Irma • Data added for 8 recent Thunderstorm Wind events
III. Wildfire Hazard	• 2012 to June 2017 Data added for both North and South Bryan County

Vulnerability is essentially the potential for loss. Vulnerability describes the ability and capacity not only to survive the event but also to recover from the event's negative effects in both short, and long-term recovery.

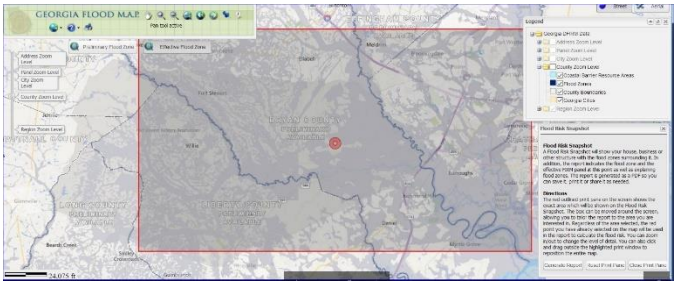
Mitigation refers to the activities undertaken to reduce or eliminate the threat, occurrence, or the damages of natural hazard events. Mitigation activities serve to protect public health and property and to break the damage-repair cycle in hazardous areas. Mitigation activities often fall into one of two categories: structural and non-structural. Structural mitigation approaches include constructing levees as a form of flood control while non-structural mitigation approaches include using an early warning system, citizen educational sessions in schools and churches, etc., or more community outreach activities, especially during Severe Weather Awareness Week in February.
This section of worksheet #1 (Appendix D) shows the NCDC and historical thumbnail view of the Hazards that tend to occur in Bryan County:

Avalanche	___	___
Costal Erosion	___	___
Coastal Storm	X	X
Dam Failure	___	___
Drought	X	___
Earthquake	___	___
Expansive Soils	___	___
Extreme Heat	X	___
Flood	X	X
Hailstorm	X	X
Hurricane	X	___
Land Slide	___	___
Severe Winter Storm	X	X
Tornado	X	___
Tsunami	___	___
Volcano	___	___
Wildfire	X	X
Windstorm	X	X
Hazard Material	___	___
Radiological	___	___
Other_____	___	___
Other		

Hazard or Event Description (Type of hazard, date of event, number of injuries, cost and types of damage, etc.)	**Source of Information**	**Map Available for this Hazard?**
Water: Hail in Belfast 6/3/2015 (0.88") Hail in Richmond Hill 1/21/2017 (0.75") Ice Storm: Inland Bryan 1/28/14	NOAA - NCDC	No
Wind: Tropical Storm Matthew, Thunderstorm wind: 8 events since 1/1/2014 ~ 50 knots. No recent tornadoes reported	FEMA, Presidential Declaration NOAA, Georgia Website	FEMA Disaster Declaration # 4284 DR Georgia Map
Fire: (5 years to May 2017) N. Bryan 49 fires; 237 acres, S. Bryan 36 fires 16 involved more than 2 acres. Total of 85	Georgia Forestry	No

The first column are hazards that could occur and the second are hazards that have occurred within Bryan County

The asset inventory component of the assessment data included the development of a database that provides county infrastructure and critical facilities data as well as estimated structure dollar values for loss estimates. The committee utilized FEMA Worksheets #3 (Inventory of Assets for the County, each city, and the unincorporated areas of the county in Appendix D) to determine the potential dollar losses to vulnerable structures in the region. The figures on the worksheets and included in this text were derived using formulas provided by FEMA and GEMA and represent structure potential loss estimations based on use, structure materials utilized, square footage, and replacement value. Each of the potential loss estimates is addressed for the individual hazards in the following text. For more specific details, refer to Worksheets #3 provided in Appendix D.



FEMA Flood Insurance Rate Map (FIRM)

We do not have an enormous amount of natural hazard occurrences, but we wish to be prepared for as many as possible through this Multi-Jurisdictional Hazard Mitigation 2019 Plan Update.

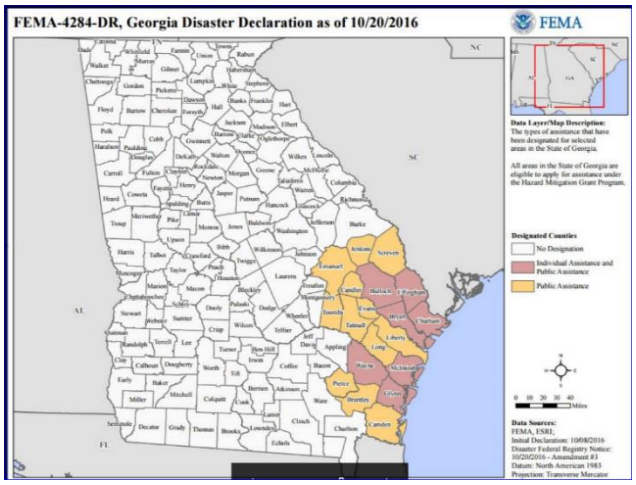
Co-ordination with State and Federal Emergency resources continues to improve, and communication is becoming "Real Time" [e.g. Each county EMA director has access to GEMA's WebEOC system for internal use in their own county, as well as for communicating Requests for Assistance (RFAs) and situational awareness to the State Operations Center (SOC.)]

SECTION I – WATER: Coastal storms, Drought, and Flooding

A. Hazard Identification - Coastal storm systems are characterized by heavy rains and gale force winds. The worst effect of these storms comes from the sea. As the storms move coastward and cross the continental shelf, the storm's strong winds drive massive amounts of sea water onto land, sometimes increasing mean water level by more than 18 feet. This storm surge is often coupled with normal astronomical tides and wind waves. This coastal flooding has potential to cause severe flooding that not only dampens but destroys exposed structures. The storms can last for several days and can be very large – 1,000-mile-wide storms are not uncommon.

B. Hazard Profile - Bryan County has suffered through several major coastal storms as the Southeast border of the county is situated along Georgia's Atlantic coastline. Were a coastal storm to cause damages to 50% of the county, losses could be as follows:

	Number of Structures			Value of Structures		
Type of Structure (Occupancy Class)	# in Community or State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area
Residential	24,289	0	50.000%	1,850,924,506	925,462,253	50.000%
Commercial	703	0	50.000%	220,330,207	110,165,104	50.000%
Industrial	26	0	50.000%	50,643,600	25,321,800	50.000%
Agricultural	750	0	50.000%	19,063,105	9,531,553	50.000%
Religious/ Non-profit	293	0	50.000%	20,629,312	10,314,656	50.000%
Government	539	0	50.000%	310,817,220	155,408,610	50.000%
Education	71	0	50.000%	554,899,900	277,449,950	50.000%
Utilities	25	0	50.000%	50,643,600	25,321,800	50.000%
Total	26,696	0	0.000%	3,077,951,450	1,538,975,725	50.000%



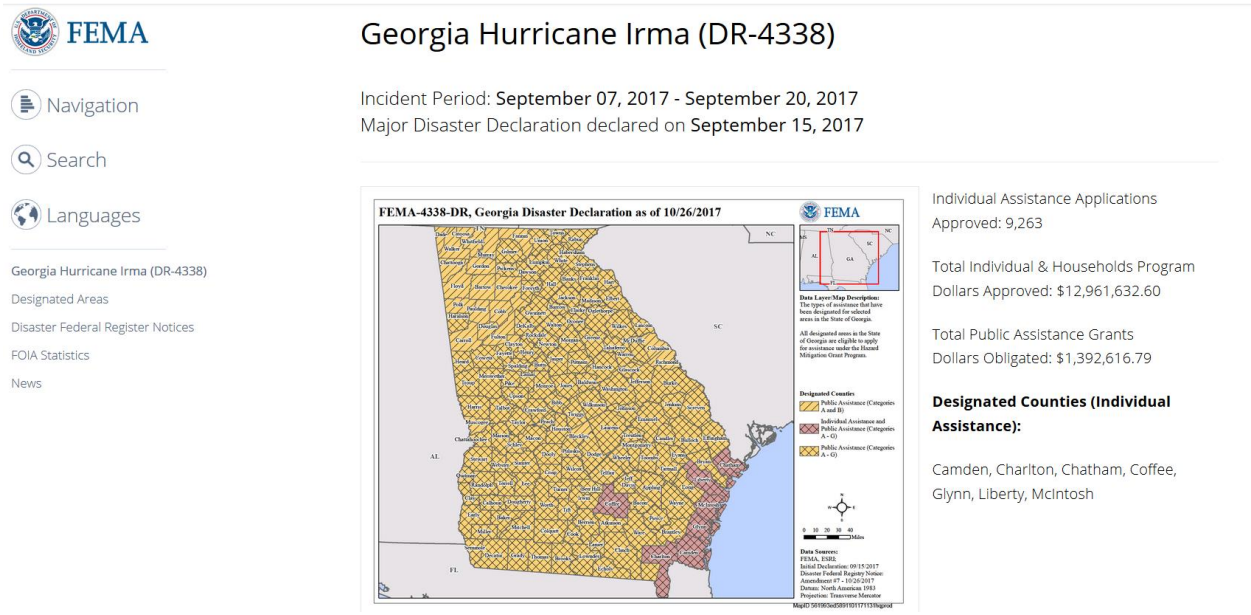
Total vulnerable structures per HAZUS report:

Table 1: GBS Building Exposure Updates by Occupancy Class*

Occupancy Classification	Default Count	Updated Count	Default Exposure	Updated Exposure
Agricultural	28	0	$ 7,957,000	$ -
Commercial	491	418	$ 254,144,000	$ 427,802,000
Education	22	35	$ 32,041,000	$ 140,519,000
Government	17	44	$ 13,657,000	$ 28,812,000
Industrial	125	167	$ 55,089,000	$ 461,480,000
Religious	57	104	$ 32,639,000	$ 87,031,000
Residential	11,027	14,778	$ 2,882,790,000	$ 2,553,606,000
Total	**11,767**	**15,546**	**$ 3,278,317,000**	**$ 3,699,250,000**

*The exposure values represent the total number and replacement cost for all Bryan County Buildings

The differences seen in property values from HAZUS to the amouts stated in the narrative are due to updates to the vaues obtained up to Jan. 1 2018 (HAZUS), and the then current "ACCG Bryan County Property Appraisal Report" used in the Chapter table and narratives.



Significant coastal storms in Bryan County have stemmed from major hurricanes in the areas: Hurricane Bertha; July 11, 1996, Hurricane Floyd September 14, 1999, and Tropical Storm Jeanne Sept. 27, 2004, Tropical Storm Tammy October 5, 2005, Tropical Storm Albert June 12, 2006, Tropical Depression Ernesto August 30, 2006, and Tropical Storm Beryl May 27th, 2012, Hurricane Matthew October 8th, 2016, and Hurricane Irma September of 2017. Most structural damage was associated with mobile homes and generally insufficiently constructed permanent structures. Several cases of large trees destroying manufactured homes were observed. Tropical Storm "Barry" made landfall along the Florida west coast during the afternoon of June 2nd, 2007. The storm then advanced north-northeast along the Atlantic coast through June 3rd. The main impacts of the storm on Bryan County were heavy rains and gusty winds, which downed trees.

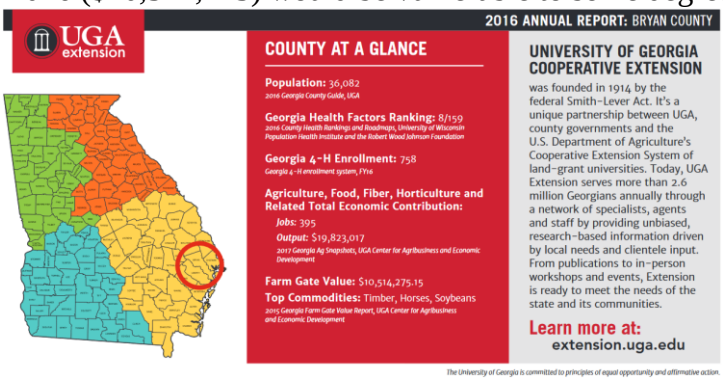
Tropical Storm Matthew: from
https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=664252

"…Matthew continued on a north-northwest track toward Florida before paralleling much of the Southeast coast in a slowly weakening state over the next couple days.
Matthew tracked parallel to the northern half of the Southeast Georgia coast as a Category 2 hurricane (110 mph), before continuing to weaken to a Category 1 hurricane (85 mph) while passing much of the lower Southeast South Carolina coast."

Coastal storms can include nor'easters, tropical depressions, tropical storms and hurricanes. Tropical depressions are considered to be an organized system of clouds and thunderstorms with a defined surface circulation and maximum sustained winds of 30 MPH (33 knots) or less. Tropical storms are defined as an organized system of strong thunderstorms with an extent defined surface circulation and maximum sustained winds of 39-73 MPH (34-63 knots). Hurricanes are defined as tropical cyclones in the Atlantic, Caribbean Sea, Gulf of Mexico, or the eastern Pacific in which the maximum sustained surface wind is 74 MPH (64 knots) or greater. Nor'easters are defined as a strong low-pressure system that affects the Mid-Atlantic and New England states. These can form over land or over coastal waters. These winter weather events are known for producing heavy snow, rain and significant waves, often causing erosion and structural damage. Wind gusts from nor'easters can equal or exceed hurricane force in intensity. Because of its latitude, Bryan County is not typically impacted by nor'easters, nor heavy or frequent snowfall.
Bryan County is subject to coastal storms up to, and including Category 5 hurricanes, in which case sustained wind speeds exceeding 155 mph can be expected with gusts potentially above 200 mph.
While Hurricane Michael in October of 2018 did damage Northwest of Bryan County, no Presidential disaster designations were necessary for Bryan County.

C. Assets Exposed to Hazard ~ 26,696 **s**tructures and facilities within Bryan County could be damaged by a coastal storm, including residential areas, commercial structures, industrial, agricultural, non-profit and religious, government owned facilities, as well as

utility and educational construction. Existing structures in the coastal storm hazard area for Bryan County (50%) are valued at $1,538,975,725 although the entire tax digest of $3,077,951,450 has the potential to be crippled by a coastal storm event due to the immediate coastal proximity of Bryan County as a whole. The Farm Gate Value for Bryan County in 2016 ($10,514,275) would be vulnerable to some degree as well.



http://intranet.caes.uga.edu/coextopr/resources/reports/2016/Bryan.pdf

D. Estimate of Potential Losses – Between damages suffered from high winds and the flash flooding that may be the results from a coastal storm, we could possibly lose 50% of the structures in Bryan County and unincorporated Bryan County at an estimated dollar value of $1,538,975,725 and could have some negative impact on ~ 36,082 persons. Estimates of potential losses of residents, homes, businesses and critical facilities by hazard were developed from the vulnerability and exposure approach analysis using past hazard frequency data and the mapping tool available with the Georgia Mitigation Information System (GMIS). The table format from the GMIS system is located in Appendix A. The Bryan County Tax Assessor and Tax Digest data provided value of structures and numbers to prepare estimates of potential losses.

E. Land Use and Development Trends – The greatest concerns during a coastal storm event are the negative effects of flooding caused by heavy rainfall and possible storm surge combined with the force of high winds. Bryan County and the Cities of Pembroke and Richmond Hill participate in the National Flood Insurance Program (NFIP), as well as adhere to the Georgia State Minimum Standard Codes (Uniform Codes Act) and the International Building Code (IBC). The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with the regulations for most natural hazards. The county ordinances guide proper setbacks from water sources and provisions for home elevations in flood zones. All other jurisdictions have adopted codes that include similar provisions.

In 2010, 223 building permits were issued as reported to the U. S. Census Bureau Data Manufacturing, Mining, and Construction Statistics. 295 issued in 2011, down to 248 in 2012. Therefore; land use and development trends cannot be predicted with reliability at this time. Permits issued in 2016 were 433 (https://www.census.gov/quickfacts/table/PST045215/13029), indicating growth is *currently* on the rise.

F. Multi-Jurisdictional Concerns – Due to Richmond Hill's location in relation to the coast, that city is at greater risk for coastal storms than Pembroke. Data indicate that 20% – 30% of the population, (which approximates the 20,495 population of Richmond Hill), of Bryan County could be adversely affected by flooding events caused by coastal storms.

As can be seen on the county website with regard to building within Richmond Hill: "The City of Richmond Hill Flood Damage Control Ordinance requires that all construction, additions, conversions and/or development located in areas of special flood hazard comply with certain minimum standards intended to minimize damage from floods. For example, houses and certain other structures are required to be built one foot above the 100-year base flood elevation. The City's Zoning Ordinance requires that building permits be obtained from the Department of Planning and Zoning. The City of Richmond Hill Stormwater Management Ordinance has restrictions on the placement of fill in special flood hazard areas. The Erosion and Sedimentation Control Ordinance requires permits for certain land disturbing activities and requires soil erosion control best management practices for construction, even if a Land Disturbance Permit is not required." http://www.richmondhill-ga.gov/index.aspx?NID=308

All of Bryan County could possibly be affected by coastal storms, but the likelihood of damages from a coastal storm being confined more to the coastal area of Bryan County is a more plausible scenario. The Bryan County website displays the county evacuation routes and a storm surge map.

Proposed mitigation steps related to coastal storms (within Chapter 3) are being undertaken on a countywide basis unless otherwise specified. Completed steps include updating local FEMA FIRM maps (published 05/05/14) and assessing effectiveness of storm water run-off and watershed plans. Richmond Hill now has a Stormwater Management Plan which was submitted to Department of Natural Resources (DNR) in January of 2015. Additional mitigation actions have been proposed to minimize future potential destruction from this hazard.

G. Hazard Summary – Bryan County is likely to sustain damage caused by coastal storms. The storms would cause damage in the region of approximately 50 % or less of the weaker built facilities and structures within the county. Due to Richmond Hill's location in relation to the Georgia coast, it is at greater risk for coastal storm damage than Pembroke. Considerable damage could be caused, particularly from heavy rainfall and high winds. Many mitigation action steps as outlined in the 2005 plan, and subsequent update written in 2013-2014 are completed or are currently underway; additional and future action steps hope to further reduce the losses from such a storm.

SECTION I - WATER: Drought

A. Hazard Identification – The GEMA Mitigation Strategy plan defines drought as a normal, recurrent feature of climate consisting of a deficiency of precipitation over an extended period of time (usually a season or more). Therefore, a drought is a protracted lack of rain or periods of abnormally dry weather sufficiently prolonged for the lack of water to cause a serious hydrologic imbalance in the affected area. Drought conditions affect the cultivation of crops as well as a water availability and water quality. Drought is also a key factor in wildfire development. Drought conditions make natural fuels (grass, brush, trees, and dead vegetation) more flammable.

Drought conditions may endure from weeks to years, which implicate droughts as having high potential to cause great hardship on a given area. The extent or duration of droughts is so important that droughts are classified in terms of length of effects. Droughts lasting 1 to 3 months are considered short term, while droughts lasting 4 to 6 months are considered intermediate, and droughts lasting longer than 6 months are deemed long term.

B. Hazard Profile – On February 22, 2001, then Governor Roy Barnes secured Economic Disaster Relief from the Small Business Administration for Georgia's seafood industry in response to the impact of drought. Bryan County was named in the declaration.

Coastal Georgia had experienced a prolonged drought period starting in 1999. In response to that situation, the United States Department of Agriculture issued an Emergency Disaster Declaration on October 18, 2002. The declaration was in response to long term drought conditions since January 2002. This declaration allowed agricultural businesses in the named counties to become eligible for emergency farm loans.

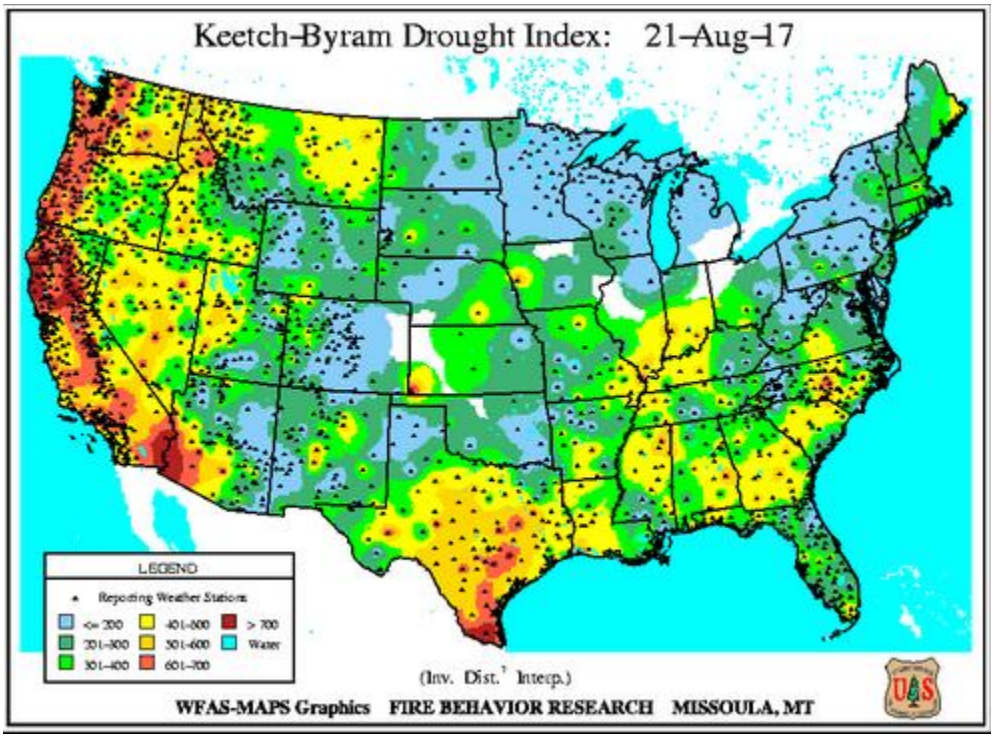
Drought conditions have increased in frequency, magnitude, and intensity in subsequent years. Georgia Governor, Sonny Perdue, declared a State of Emergency in Drought Executive Order 011808 on October 20, 2007 that was extended on November 20, 2007, and again on December 19, 2007. Because the condition was declared a Level 4 drought for most of the state, increased levels of drought response were necessary. Thus, the executive order called for establishment of the Drought Response Unified Command and the Drought Response Working Group to be consistent with the Georgia Emergency Operations Plan. The order also called for the implementation of the State of Georgia Drought Response Strategy. More information

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions.	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44+	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies.	less than -2	D4	-5.0 or less

*NDMC - National Drought Mitigation Center

regarding the drought response can be found on the Drought Response Unified Command's website: https://www.piersystem.com/go/site/1619/
Because of the slow rate of onset, and long duration of droughts in Georgia, long-term management and mitigation measures are appropriate. The Environmental Protection Division (EPD) of Georgia's Department of Natural Resources (DNR) lists one of their goals as: "Replace DNR's current Drought Management Plan and Rules for Outdoor Water Use, Chapter 391-3-30 with new Rules for Drought Management as provided by HB 1281 passed in 2008." In June of 2015 this Press Release addressed the next phase of Groundwater Management which also includes Bryan County.

For the 2019 Plan Update process, committee members reviewed National Climatic Data Center information indicating that the prolonged drought conditions resulted in little to no crop damages reported. Of great risk for the county and municipalities is that drought conditions contribute to the severity of Wildfire Hazards.



Drought severity extent as measured by the Palmer Drought Index indicates that Bryan County has the potential for Minor Drought Conditions (D0). The Keetch and Byram drought index (KBDI) is designed specifically for fire potential assessment. The number represents the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in upper soil layers. Zero is the point of no moisture deficiency and 800 is the maximum drought that is possible. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero, or saturation conditions. Bryan County can experience a range of 100 to 500 KBDI.

Statistically, Bryan County can expect to experience drought conditions in the future. Droughts in 1999, February of 2001, October of 2002, and Oct. – Dec. 2007 indicate a 0.1 – 0.2 chance of occurrence. Hazard Frequency Table data is located in Appendix D.

C. Assets Exposed to Hazard – Drought conditions typically pose little or no threat to structures, however, fires can occur as a result of dry weather. The Bryan County Joint Hazard Mitigation Plan Update Committee concluded that drought, in and of itself, presents no credible threat to critical facilities. Wildfire, as a result of drought, was considered, and the Committee determined that this hazard does bear a significant threat to the community.

The Georgia Forestry Commission is in the process of updating Bryan County's Fire Wildfire Risk Assessment. This assessment includes enhanced mapping features that will be published in the Community Wildfire Protection Plan (CWPP). This plan will provide for greater mitigation efforts in this Hazard Mitigation Update.

GEMA Worksheet #3 – Inventory of Assets for Bryan County and the Cities of Pembroke and Richmond Hill is located in Appendix D.

D. Estimate of Potential Losses –Potential drought losses are calculated on the value of agriculture in the county. According to the *University of Georgia's 2016* Farm Gate Value Report, This includes over 20,000 acres of farmland**.** The Farm Gate value listed in 2016 ($10,514,275) would be at risk.

E. Land Use & Development Trends - Bryan County and unincorporated Bryan County currently have no land use or development trends related to drought conditions. The expectation is for guidance to come from the State and Coastal Regional Water Plans for the local governments to implement.

F. Multi-Jurisdictional Concerns – All of Bryan County could potentially be affected by drought conditions, particularly as concerns the seafood industry and the threat of wildfire. Detailed jurisdictional information will be available with the Community's Wildfire Risk Assessment. Jurisdictional mitigation efforts will be addressed in the Community Wildfire Protection Plan (in progress.)

G. Hazard Summary – Drought can cause severe economic stress to not only the agricultural and forestry interests in Bryan County, but to the entire State. The potential negative effects of sustained drought are numerous. In addition to an increased threat of wildfires, drought can have an effect on municipal and industrial water supplies, stream-water quality, water recreation facilities, and agricultural and forest resources. The Bryan County 2019 Hazard Mitigation Plan Update Committee reviewed previous mitigation efforts. Those efforts to increase surface water irrigation and to promote use of surface artesian flow for irrigation are currently underway. Further actions will be based, in part, by the guidance coming from the State and Coastal Regional Water plans.

SECTION I – WATER: Flooding, Storm Surge

A. Hazard Identification – A great number of all Presidential Disaster Declarations are associated with flooding. The variety of floods is as diverse as are the nation's natural resources, ranging from localized flash flood covering several city blocks to massive flooding encompassing up to a quarter of the area of the lower 48 states. Flash floods are typically caused by short, intense rainfall over areas as small as a city to larger than a state. Flash flooding risks can occur well away from rivers and streams. Water pools in low spots such as underpasses and low levels of buildings because rain falls faster than the ground can absorb it. Year in and year out, flash floods take more lives than any other type of flooding – most flood fatalities involve motorists. The cumulative effect of widespread, prolonged flash flooding can lead to flooding of smaller streams and, if enough rain falls, major river systems.

Floods are loosely classified as either coastal or riverine. Bryan County is vulnerable to both types. Coastal flooding: driving winds associated with hurricanes pushes water inland, causing storm surges that can exceed 20 feet, causing devastation in coastal areas. The storm surge is often the catalyst behind many of the deaths associated with coastal storms and hurricanes. Riverine flooding occurs from inland water bodies such as streams and rivers. Riverine flooding (see the 2018 HAZUS Riverine Losses Table below) is often classified based on rate of onset, and is typically slow to build, peak, and recede - often allowing sufficient time for evacuations.
The Bryan County 2019 Hazard Mitigation Plan Update Committee also examined historical data from SHELDUS and the National Climatic Data Center to update research on the effects of

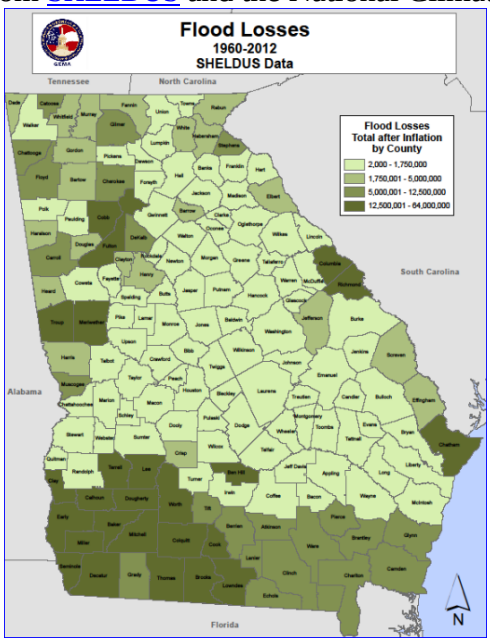


Table 9: Bryan County Riverine 1% Building Losses

Occupancy Classification	Total Buildings	Total Buildings Damaged	Total Building Exposure	Total Losses to Buildings	Loss Ratio of Exposed to Damaged
			Pembroke		
Residential	921	64	$ 126,340,688	$ 1,672,109	1.32%
Industrial	23	3	$ 22,381,379	$ 14,786	0.07%
Commercial	79	4	$ 61,753,145	$ 60,358	0.10%
			Richmond Hill		
Religious	17	1	$ 20,221,955	$ 21,119	0.10%
Commercial	242	73	$ 199,847,558	$ 5,653,641	2.83%
Education	17	1	$ 46,189,167	$ 160,150	0.35%
Industrial	93	15	$ 100,876,569	$ 3,233,312	3.21%
Government	13	3	$ 8,749,762	$ 171,330	1.96%
Residential	4,635	1,211	$ 896,928,714	$ 27,814,085	3.10%
			Unincorporated		
Commercial	97	5	$ 166,218,825	$ 46,677	0.03%
Government	18	1	$ 12,511,355	$ 9,105	0.07%
Industrial	51	4	$ 338,225,394	$ 346,763	0.10%
Residential	9,222	1,462	$ 1,530,355,010	$ 41,742,390	2.73%
			County Total		
Total	15,428	2,847	$ 3,530,599,521	$ 80,945,825	

flooding in Bryan County. Detailed tidal flooding analyses were performed on the entire Bryan County coastline, which includes the Ossabaw Sound / Ogeechee River and St. Catherines Sound / Medway / Laurel View / Jericho River. Flood elevations were determined for the Ossabaw Sound / Ogeechee River and St. Catherines Sound / Medway / Laurel View / Jericho River. This study includes coastline flooding due to hurricane-induced storm surge. Both the open coast surge and its inland propagation were studied. In addition, the added effects of wave heights were considered.

Portions of Bryan County are located in known floodplains. Floodplains are lowlands, adjacent to rivers and oceans that are subject to recurring floods. A flood is a natural event for rivers and streams. Excess water from rainfall or storm surge accumulates and overflows onto the banks and adjacent floodplains.

The Bryan County Hazard Mitigation 2019 Plan Update Committee examined historical data from the National Climatic Data Center, and found only 11 Flash Flood and High Surf events in the past 20 years for flooding in Bryan County; six of which were in 2007. Several years ago, "Carney said: Pembroke is no stranger to flood damage, (citing the flooding the city endured several years ago) the Dollar General, which is in a flood zone, had water levels that reached up to their cash registers."

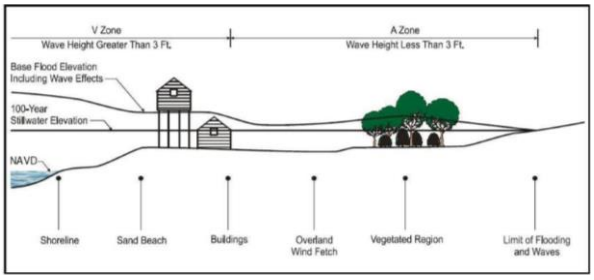
Bryan County has dealt with flood in the past, and attempts in this plan update, to mitigate, where possible, damages to human and animal life, and losses to private properties, businesses, and agricultural assets in the future. Bryan County is a Storm Ready Community.

We should not discuss a flood hazard on the coastal section of Bryan County without including a hazard known as Storm Surge. The National Hurricane Center (NHC) defines storm surge as "...an abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed sea surface and the level that would have occurred in the absence of the cyclone." Storm surge that is produced by a tropical cyclone is a function of both tropical cyclone and geographic characteristics. Tropical cyclone characteristics affecting storm surge values include the intensity of the hurricane (strength of the winds and central pressure), angle of approach, and forward speed. Geographic characteristics

that affect the extent of storm surge include bathymetry, slope of the continental shelf, roughness of the continental shelf, shape of the coastal region, and existence of natural or manmade barriers.
Source:
http://www.gema.ga.gov/Plan%20Library/Hurricane%20Plan%20%282013%29.pdf

The rate of onset of a storm surge has a smaller range than the storm itself. While the storm may show signs of approach up to days before the storm peaks, the storm surge will often appear somewhat suddenly. The surge can reach inland for miles along a vast span of coastline (which depends on the size and strength of the storm). This rapid rate of onset is the major contributor to the many deaths associated with storm surge. The duration of the surge event depends on the depth of the surge and other environmental factors such as drainage capability. The waters from the surge may remain for days in certain areas. The frequency of storm surges of a certain magnitude greatly depends on the frequency of tropical cyclones with the ability to produce the surge. The measure of magnitude of storm surge is largely based upon height above mean water level. (Tropical cyclones are not the only type of storms that can cause destructive storm surge, but in Georgia it would most likely be the cause.)

At the end of September in 2007, "*Strengthening High pressure over New England and low pressure off the Southeast U.S. coastline, resulted in a tight pressure gradient across southern South Carolina and Southeast Georgia. Strong Northeast winds and High Astronomical Tides combined to produce significant Beach Erosion across the region."*
Source: https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=59407



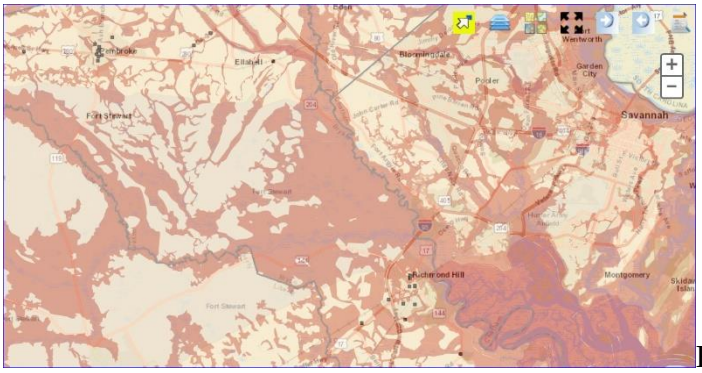
This Transect schematic reflects natural conditions in Bryan County.

B. Hazard Profile – Injuries and fatalities to humans and animals have been, and potentially can continue to be, a direct result of destructive forces from flood waters. In a flash flood situation, the water can be deceivingly deep, and the speed with which it moves can exhibit great force.

In the Georgia DFIRM Update: "Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-,

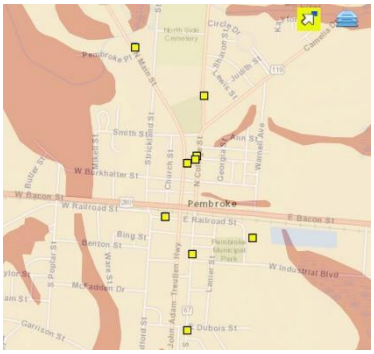
100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year."

All structures and facilities within Bryan County could be damaged by flood waters including all public safety facilities, government buildings, education centers, and commercial and residential areas which would include devastation to crops. The lower lying areas (as the GMIS maps indicate) would have a higher likelihood of damage from this occurrence. Within Bryan County, flooding has caused significant damage on several occasions. Mitigation strategies in Chapter three will work toward protecting the county's revenues and assets and be should be implemented countywide, and include the cities of Pembroke and Richmond Hill.



Bryan County

Pembroke



Richmond Hill

Flood (5)

- <all other values>
- 0
- 1
- 2
- 3
- 4

Score	Original Value	Description
4	Floodway	Floodway (within zone AE)
	V	1% with Velocity no Base Flood Elevation (BFE)
	VE	1% with Velocity BFE
3	A	1% Annual Chance no BFE
	A99	1% Federal flood protection system
	AE	1% has BFE
	AH	1% Ponding has BFE
	AO	1% Sheet Flow has depths
	AR	1% Federal flood protection system
2	X500	0.2% Annual Chance
1	ANI	Area not included in survey
	D	Undetermined but possible
0	UNDES	Undesignated
	X	Outside Flood Zones

C. Assets Exposed to Hazard – Using best available data, the Bryan County Hazard Mitigation Planning Committee determined that 35 percent of the assets in Bryan County are vulnerable to flooding events. Flood waters which make roads impassable are of a very high danger to citizens that are now, in essence, cut off from access to emergency services as well as the supplies necessary to keep themselves hydrated, fed, and protected from the elements. Another concern within Bryan County, concurrent with flooding, is evacuation of residents during severe storm events. In March of 2006, a tabletop exercise & presentation provided both evacuation, and the phases of re-entry guidance, and the storm surge maps for Category 1 through 5 storms.

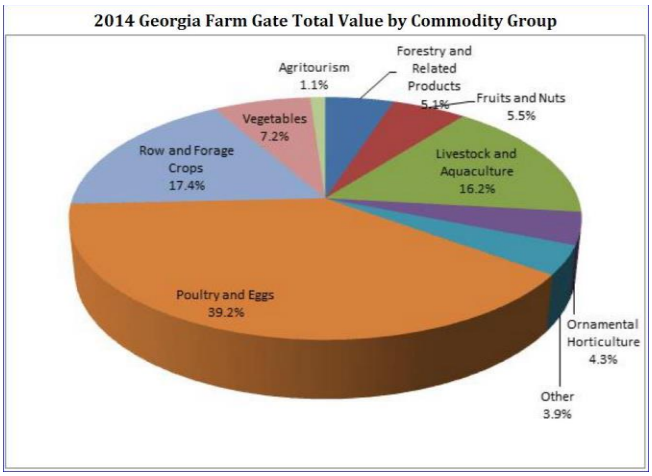
Bryan County actively promotes the use of FEMA and floodplain management activities through the County Website. New FIRM maps were effective in Bryan County on March 2, 2009 utilizing the new digital maps. The 2009 Flood Insurance Study Number 13029cv000a for this can be found in Appendix B.

The GMIS system reports no repetitive loss properties. The maps above also show 6 critical facilities are in #3 flood zone (one being a lift station.) Discussions are underway regarding the best way to mitigate this.

D. **Estimate of Potential Losses –** By its unpredictable nature, flooding is more likely to occur in the higher risk areas, but as the severity of the hazard rises, so does the water level, and the area in jeopardy.

Flood loss estimation is an imprecise effort. Direct loss to infrastructure, critical facilities and businesses in terms of repair and replacement is hindered by the lack of monetary damage records for flood events in Bryan County. Both NCDC and SHELDUS present the same voids in comprehensive planning data. FEMA declared disasters gave no specifics on individual counties.

The plan update committee, using guidance provided in FEMA How-To-Guide 386-2, Understanding Your Risks, Identifying Hazards and Estimating Losses, to determine about 35% of assets could be lost to a severe flood event. GMIS reports for flood (which can be found in Appendix A) reflect loss estimates for the critical facilities within Bryan County. Worksheets #3 in Appendix D, calculate an estimate for potential flood losses for residential and other non-critical structures. At the 35% loss projection, a monetary value of $1,077,283,008 represents losses of residential, commercial, industrial, agricultural, religious & non-profit, government, educational, and utility structures in Bryan County. Damage to crops, poultry and livestock, and other agricultural assets are not taken into account in the above figures. The chart below lists what the total Farm Gate Value (FGV) in Georgia is comprised of. Bryan County has a 2014 FGV of $11,891,014 and all of those listed in the chart below are dependent upon water, be it drought or flood, 100% of those are vulnerable. (The report from 2016 revises those figures to $10,514,275.)



http://caes2.caes.uga.edu/center/caed/documents/2014UGACAEDFGVR_FINAL.pdf

E. Land Use & Developmental Trends – Bryan County and cities of Pembroke and Richmond Hill participate in the National Flood Insurance Program (NFIP) and intend to maintain their compliance with the NFIP with no listed Mitigated properties. The GMIS Map of Richmond Hill for flood demonstrates that the city has been built to the west of the flood area. (see Section B, page 12 of this Chapter for those maps.)

Bryan County ordinances dictate construction within the county will be in compliance with the Georgia State Minimum Standard Codes (Uniform Codes Act) and the International Building Code (IBC). The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with these regulations.

F. **Multi-Jurisdictional Concerns** – Approximately 53% of Bryan County could potentially be adversely affected by flood waters. As a result, any mitigation steps taken related to floods should be undertaken on a countywide basis. Less likely to suffer significant losses are the cities of Pembroke and Richmond Hill. FEMA acknowledged Pembroke as having an improved CRS Class 9 rating in April 0f 2017. The new FEMA FIRM indicates the higher susceptibility areas to be found adjacent to the natural bodies of water at, and near its county borders. The Stormwater Management Plan for Richmond Hill was submitted to the DNR in January of 2015. At the Richmond Hill website, the floodplain management map, a "Flood Protection Library" of helpful links, Elevation Certificates (by year), river gauge, and contact information to answer further questions can be accessed.

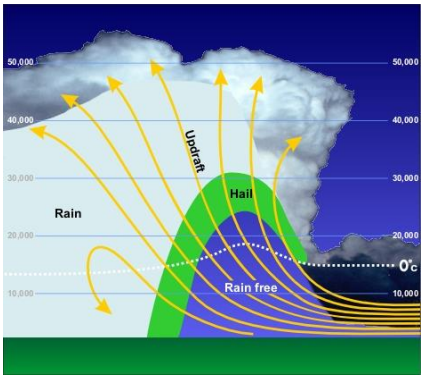
Throughout the town of Pembroke there are ~20 miles of canals. As part of a Greenway Initiative Program, the early part of 2019 is scheduled for the clearing of those canals to promote better drainage away from residences as well as aiding in the control of mosquitos. (See Appendix B for the full December 2018 article.)

G. **Hazard Summary –** In the past, severe flooding has inflicted damage in coastal and inland Bryan County. Committee members recognized the destructive nature of flooding and identified many mitigation measures as a high priority. Bryan County has a high potential for exposure to damages caused by hurricanes. Committee members spent considerable time deliberating appropriate mitigation strategies to reduce the deleterious impacts from such a storm. While no amount of mitigation can prevent a flood, damages caused by a major (Category 3, 4, or 5) hurricane, early warning systems designed to reach the citizenry, and additional planned evacuation routes should afford more safety.

SECTION I – WATER – Hailstorms

A. Hazard Identification –

Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. Hail can damage aircraft, homes and cars, and could possibly endanger smaller livestock and/or people.



Hailstones grow by collision with super cooled water drops. (Super cooled drops are liquid drops surrounded by air whose temperature is below freezing – a common occurrence in thunderstorms.) There are two methods by which the hailstone grows, wet growth and dry growth, and which produce the "layered look" of hail.

In wet growth, the hailstone nucleus (a tiny piece of ice) is in a region where the air temperature is below freezing, but not super cold. Upon colliding with a super cooled drop, the water does not immediately freeze around the nucleus. Instead liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape resulting in a layer of clear ice. With dry growth, the air temperature is well below freezing and the water droplet immediately freezes as it collides with the nucleus. The air bubbles are "frozen" in place, leaving cloudy ice.

B. Hazard Profile – Data for this hailstorm profile was produced by the National Climatic Data Center (NCDC) database. In the last 20 years 32 events have been recorded. No losses

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-**15**	>20	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-**75**		Severe roof damage, risk of serious injuries
H8	Destructive	60-**90**		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

* Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.

in crop damages have been reported.

Although committee members recognize damages by hail events to homes and vehicles, insurance claim data was not available to the committee. The frequency of events appears to be increasing. Hazard frequency data must consider that data collection and accuracy have been much better in the past 10 years (NCDC weather records). Of the 32 recorded events in the 20-year recorded storm history (2/27/1997 to 2/28/2017), 20 events occurred in the past ten years. This seemingly increased frequency (12 to 20) provides a basis for including the storm events in this Plan Update, as the likelihood exists for 1 to 2 hailstorm events each year.

The extent of potential hail damage is expressed by the Hailstorm Intensity Scale (TORRO). The scale ranges from H0 to H10 and describes the size of hail and the general description of damage that can be caused. Previous hail events in Bryan County have produced hail between 0.75 inches to 2.5 inches. The latter intensity category would be H7 (Destructive) 50-75mm with severe roof damage, cars are damaged, and there is a risk of serious injury to anyone outdoors and unprotected, including livestock and crops.

Statistically, Bryan County can expect a hail storm frequency of 165 % in any given year. (Hazard Frequency Table data is located in Appendix D.)

C. Assets Exposed to Hazard – Vulnerable assets in the county include all buildings, and crops, excluding timber. The timber industry is aggregated in the agricultural category. Therefore, that portion of the agriculture category was excluded from the vulnerability data. Proposed development will not affect or increase mitigation efforts, but could add to potential losses should development occur.

GEMA Worksheet #3 – the Inventory of Assets for Bryan County and the Cities of Pembroke and Richmond Hill is located in Appendix D.

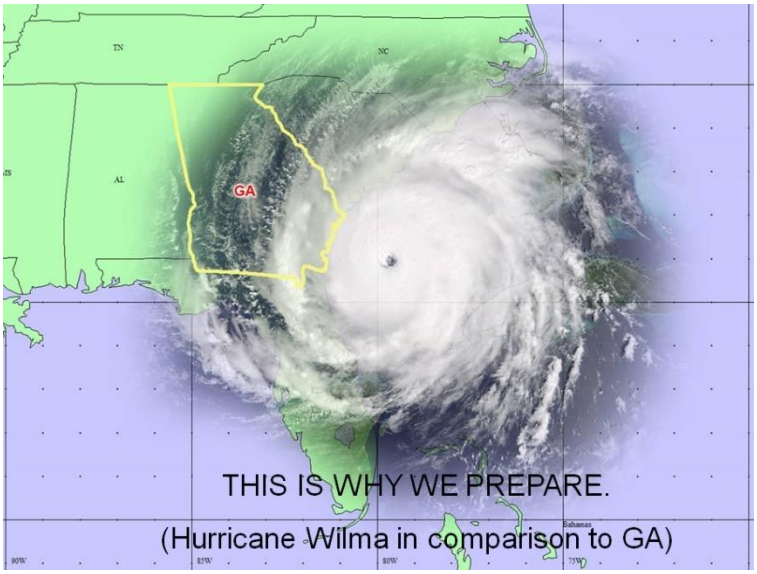
D. Estimate of Potential Losses – For Bryan County that means exposing up to 36,082 people and an extremely large amount of poultry, livestock, and other farm animals, as well as crop acres to this hazardous storm event. The 2016 Farm Gate Value was listed at $10,514,275.

E. Land Use & Developmental Trends – Bryan County, Pembroke, Richmond Hill, and unincorporated Bryan County currently have no land use or development trends related to hailstorm events as it is not a spatially defined natural hazard.

F. Multi-Jurisdictional Concerns – All of Bryan County can potentially be negatively affected by hailstorm events, and the damages from these storms are not isolated to specific places. All Chapter 3 Actions Steps which apply to hail should be equally considered for Bryan County, Pembroke, and Richmond Hill.

G. Hazard Summary – Hailstorms are an element of severe weather that may include lightning and tornadoes. Typically, these storm events afford communities some advance warning. The National Weather Service issues storm warnings and advisories as these storms approach. In the current high-volume smart phone world, there are many local television news weather Apps, as well as National Weather Service's offering free Apps for early warnings for citizens. Advance warning may allow citizens to protect life and some property, but crops, poultry, livestock and automobiles may sustain severe damage. Also, motorists pose an additional danger on faster roads and highways during a Hail Event.

SECTION I – WATER: – Hurricanes, Tropical Storms

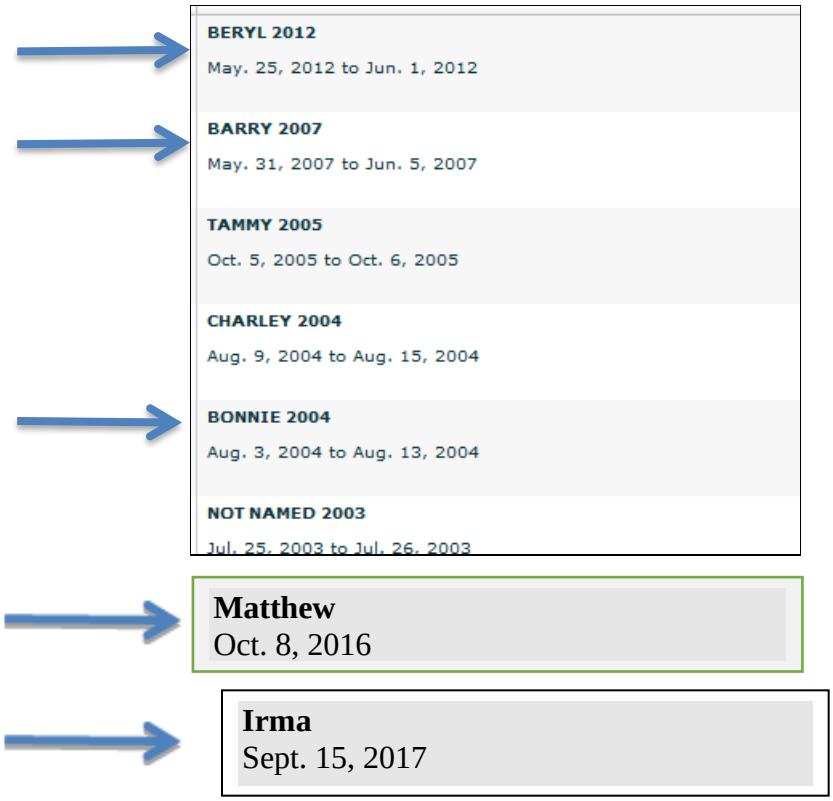


A. Hazard Identification – A hurricane is a category of tropical storm of wind speeds greater than 74 or more miles per hour. Hurricanes develop over warm waters and are caused by the atmospheric instability created by the collision of warm air with cooler air. Hurricane winds blow in a large spiral around a calm center called the eye, which can be 20-30 miles wide. When a hurricane nears land, it may bring torrential rains, high winds, storm surges, coastal flooding, inland flooding, and sometimes, tornadoes. A single hurricane can last for more than two weeks over water and can extend outward 400 miles. The hurricane season for the Atlantic coast is June 1 to November 30.

The 2008 hurricane season was a record-breaking year for tropical cyclones. A total of 16 named storms formed. There were eight hurricanes, five of which were major hurricanes. An average season has 11 named storms, six hurricanes and two major hurricanes.

Some hurricanes are characterized primarily by water – a rainy or wet hurricane – while others are primarily characterized by wind - a windy or dry hurricane. Wet hurricanes can flood both coastal and inland areas, even as the storm dissipates in wind strength; while windy hurricanes primarily affect coastal areas with their high winds and storm surge. Because hurricanes are large moving storm systems, they can affect entire states or entire coastlines.

B. Hazard Profile – Hurricane data from NOAA indicates that Bryan County has been affected by the following hurricanes:



GMIS 2018 Critical Facility's Reports for SLOSH for hurricane events list six facilities with a score of 4, nine facilities with a score of 3, one facility with a score of 2, and no facilities had a score of 1.

SLOSH Hazard Scores

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) is a computerized model to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes by taking into account pressure, size, forward speed, track, and wind speed from a storm. This layer represents the SLOSH results from a hypothetical event, showing SLOSH inundation areas for each category in the Saffir-Simpson Hurricane Scale. The areas inundated by a category 4 or category 5 storm surge have been combined to reflect their decreased probability of occurrence. The horizontal positional accuracy is unknown for this layer.

Prior Hurricane activity:

The 2005 Hurricane Katrina evacuations affected all Georgia counties. The data from the Tropical Prediction Center shows effects, but not necessarily a direct hit, from these hurricanes on Bryan County. Accounts of the impact of Hurricane Dora in the Bryan area can be found in the book *Early Days on the Georgia Tidewater* written by local historian, Buddy Sullivan. Dora tracked in during the day on September 9, 1964, then made landfall just north of St. Augustine, Florida. The lower Georgia coastline was locked squarely in the path of the strong –side counterclockwise winds. The heavy winds created tidal surges and caused damage as far north as Tybee Island, which is just north of coastal Bryan County. Sustained winds of 90 to 100 mph, along with torrential rains and higher than normal tides, caused an estimated 8 million dollars of damage for the Georgia coast.

Hurricanes Bertha and Fran threatened, but missed the Georgia coastal counties.

Hurricane Floyd, September 16, 1999, caused the largest peacetime evacuation in history. Approximately 350,000 coastal residents joined more than 2 million people from Florida, South Carolina and North Carolina. Floyd was a Category 5 storm while at sea, but was downgraded to a Category 2 when it made landfall near Cape Fear, North Carolina. The coastal Georgia counties were spared hurricane damage.

per HAZUS study:

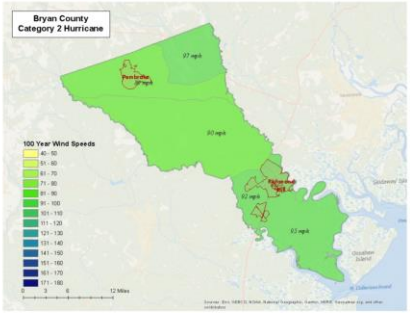


Figure 3: Wind Speeds by Storm Category

Hurricane Matthew,

Formed: September 28, 2016 and dissipated: October 10, 2016. (The HAZUS map to its right indicates the winds that can be expected for the varying jurisdictions in a Cat 2 hurricane event.)

Matthew tracked about 25 miles west of Nassau before making landfall for a 3rd time over Grand Bahama about 15 miles west-northwest of Freeport as a Category 4 hurricane on October 6th. Matthew then continued on a north-northwest track toward Florida before paralleling much of the Southeast coast in a slowly weakening state over the next couple days. Matthew tracked parallel to the northern half of the Southeast Georgia coast as a Category 2 hurricane (110 mph), before continuing to weaken to a Category 1 hurricane (85 mph) while passing much of the lower Southeast South Carolina coast.

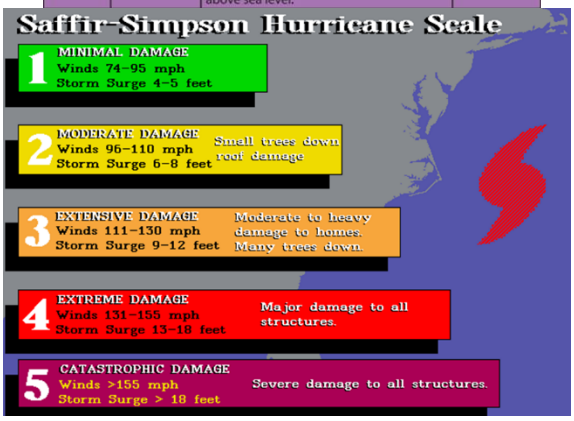
Across southeast Georgia and southeast South Carolina, the main effects from Matthew included heavy rain, wind damage in the form of scattered to widespread trees and power lines blown down, and storm surge. Total rainfall amounts generally ranged from 4.5 to 7 inches across western areas of Southeast Georgia and extreme western locations of Southeast South Carolina to 8 to 17 inches closer to the coast, highest in coastal counties of Southeast Georgia and the lower Southeast South Carolina coast. A peak storm total rainfall of 17.49 inches was recorded at Hunter Army Airfield in Georgia (just 21 miles from Richmond Hill).

Due to Richmond Hill's immediate location in relation to the coast and its flood area size in relation to other cities, this city is at greater risk for hurricane damage from rain and winds than Pembroke.

The probability of a hazardous event caused by a hurricane in Bryan County is 0.3 to 0.5 per cent per year. Besides the threat of flooding and high winds, hurricanes also carry the added threat of tornadoes.

Bryan County is subject to coastal storms up to and including Category 5 hurricanes. Storm surge has the potential to be severe, (greater than 18 feet of storm surge water is possible.)

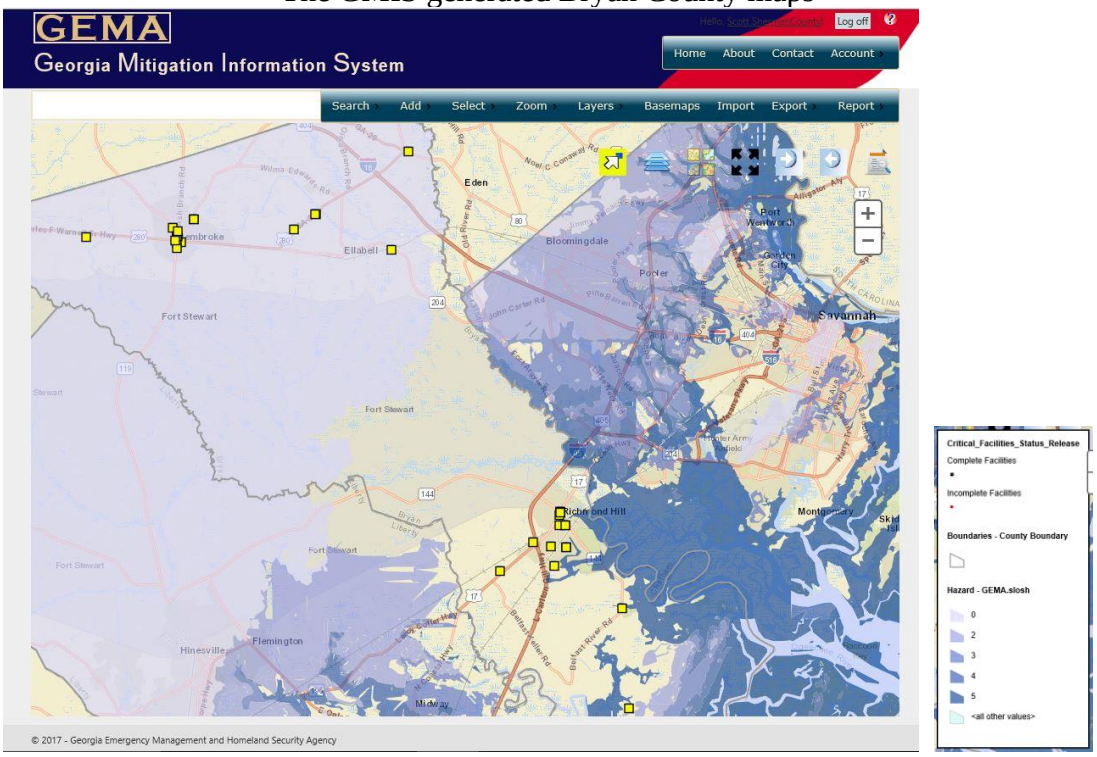
Saffir-Simpson Hurricane Scale			
Category	*Winds (MPH)*	*Damage*	*Storm Surge*
1	74 - 95	**Minimal**: Damage to unanchored mobile homes, vegetation & signs. Coastal road flooding. Some shallow flooding of susceptible homes.	4 - 5 feet
2	96 - 110	**Moderate**: Significant damage to mobile homes & trees. Significant flooding of roads near the coast & bay.	6 - 8 feet
3	111 - 130	**Extensive**: Structural damage to small buildings. Large trees down. Mobile homes largely destroyed. Widespread flooding near the coast & bay.	9 - 12 feet
4	131 - 155	**Extreme**: Most trees blown down. Structural damage to many buildings. Roof failure on small structures. Flooding extends far inland. Major damage to structures near shore.	13 - 18 feet
5	More than 155	**Catastrophic**: All trees blown down. Some complete building failures. Widespread roof failures. Flood damage to lower floors less than 15 feet above sea level.	Greater than 18 feet

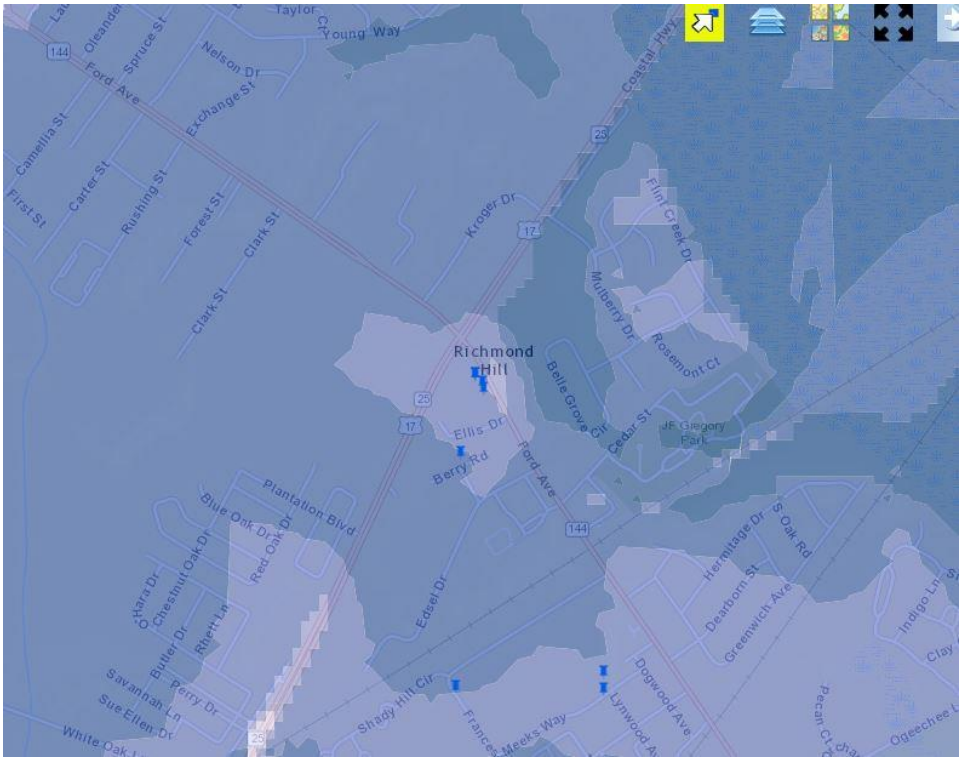


Hazard Frequency Table data is located in Appendix D.

C. Assets Exposed to Hazard – All structures and facilities within Bryan County could be damaged by a hurricane event, including all public safety facilities, government buildings, water and wastewater treatment facilities, public utilities, education centers, the public library and commercial and residential areas. Existing buildings in the coastal storm hazard area may number 26,696 (24,289 residential, 703 commercial, 26 industrial, 750 agricultural, 293 religious/nonprofit buildings, 539 government and 96 in education and utilities.) with a total worth of $ 3,077,951,450.

The GMIS generated Bryan County maps





and Richmond Hill for Sea, lake, & overland surges from hurricanes (SLOSH)

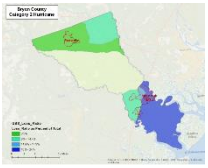
Score	Original Value	Description
5	1	Inundated by a Category 1 Hurricane
4	2	Inundated by a Category 2 Hurricane
3	3	Inundated by a Category 3 Hurricane
2	4	Inundated by a Category 4 Hurricane
	5	Inundated by a Category 5 Hurricane

Current economic conditions in Bryan County have made it difficult to predict future growth.

From 2006-2010, the number of building permits issued decreased from 555 in 2006 to 223 in 2010. This decrease in building permits also demonstrated a decrease of over $60,000,000 in tax base increase Permits that were issued in 2016 amounted to 433 suggesting a rise in growth once again. (https://www.census.gov/quickfacts/table/PST045215/13029)

D. Estimate of Potential Losses – Estimates of potential losses of residents, homes, businesses and critical facilities by hazard were developed from the vulnerability and exposure approach analysis using past hazard data and the mapping tool available with the Georgia Mitigation Information System. The table format from the GMIS system is located in the Appendix. The Bryan County Tax Assessor provided current numbers and value of structures to prepare estimates of potential losses for each category of structure as seen in Section C above. Additional clarification of population categories is found on Worksheet 3 located in Appendix D.

E. Land Use & Developmental Trends – The largest concerns during a hurricane event are the results of flooding caused by heavy rainfall and storm surge and the impact of high winds. Unincorporated Bryan County and the Cities of Pembroke and Richmond Hill participate in the National Flood Insurance Program (NFIP), as well as adhering to the Georgia State Minimum Standard Codes (Uniform Codes Act) and the International Building Code. The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with the regulations for most natural hazards. The Unified Development Code was adopted by the county, and includes proper setbacks from water sources and provisions for home elevations in flood zones. Richmond Hill spent from 2014 – 2016 developing, and adopting their Unified Development Ordinance to address future growth as well as assuring that present codes were audited on a regularly. A copy of this ordinance can be found in Appendix C.



F. Multi-Jurisdictional Concerns – All of Bryan County could potentially be affected by a hurricane event. The HAZUS study map at left addresses probable damage areas associated with their Cat 2 model. Building codes have addressed the setback issues. Maintaining storm water facilities and drainage ditches

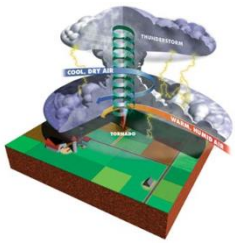
will be an ongoing task. Committee members approved of the past community awareness efforts by the American Red Cross Community Disaster Education programs and seek to continue those efforts. The Public-Address system through the Code Red program has been successfully implemented providing for early warning systems and early evacuation. Planned evacuation processes and reentry processes are addressed in Bryan County website displays: the county evacuation routes and a storm surge map.

G. Hazard Summary - Bryan County has a high probability for exposure to potential damages caused by hurricanes. The worst effect of tropical cyclonic storms, especially powerful hurricanes, comes from the sea. As the storm moves coastward and crosses the continental shelf, the storm's strong winds drive massive amounts of sea water onto land, sometimes increasing mean water level by more than 18 feet. This storm surge is often coupled with normal astronomical tides and wind waves. This coastal flooding has potential to cause severe flooding that not only dampens but destroys exposed structures.

The rate of onset of a storm surge has a smaller range than the storm itself. While the storm may show signs of approach up to days before the storm peaks, the storm surge will often appear somewhat suddenly. This rapid rate of onset is the major contributor to the many deaths associated with storm surge. The duration of the surge event depends on the depth of the surge and other environmental factors such as drainage capability. The waters from the surge may remain for days in certain areas. Georgia's coastal counties have experienced varying degrees of coastal flooding in the past and recently. Georgia's coastal counties have great potential for a massive tropical cyclone to hit directly, causing an overwhelming storm surge.

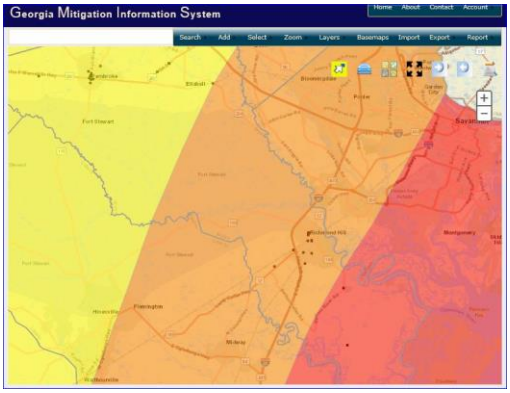
SECTION II – WIND: Tornado

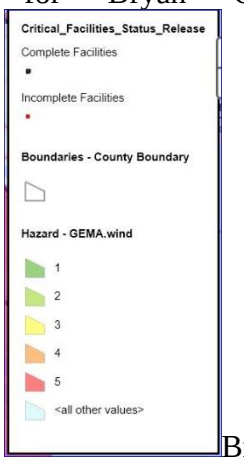
A. Hazard Identification – A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 miles per hour or more. Damage paths can be seen in excess of 1-mile wide and 50-miles long. Tornadoes are among the most unpredictable of weather phenomena. Tornado season typically from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present.



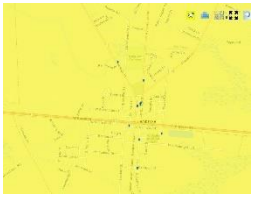
Thunderstorms and hurricanes spawn tornadoes when cold air overrides a layer of warm air, causing the warm air to rise rapidly. The winds produced from hurricanes and wildfires have also been known to produce tornadoes. All action steps for wind damages for Tornado will also be applicable to wind events for other Natural Hazards.

Wind (Tornado) hazard maps for Bryan County and the Cities:





Bryan County



Pembroke and

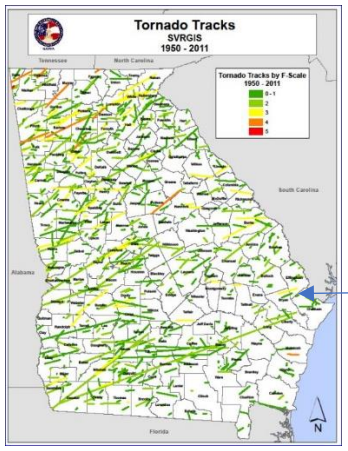
Richmond Hill

Score	Original Value	Description
5	> 120 mph	3 second gust greater than 120 mph
4	110 to 119 mph	
3	100 to 109 mph	
2	90 to 99 mph (or ZONE IV)	This score is also given to an area with Zone IV of the "Design Wind Speed Map for Community Shelters," representing an area exposed to 250 mph winds. This area is the Northwestern corner of the state.
1	< 90 mph	

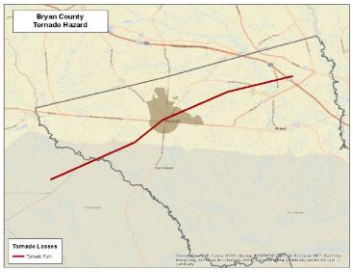
B. Hazard Profile – According to records maintained by the National Climatic Data Center (see Appendix A.), Bryan County has been impacted by 4 tornadoes or funnel clouds in the last 20 years. Frequency of occurrence can be expected at 0.20 per cent per year. Tornado events in Bryan County have resulted in crop and property damage.

Bryan County historical area-adjusted tornado activity is slightly below Georgia state average. It is 1.2 times above overall U.S. average.

Tornadoes in this county have caused 5 fatalities and 16 injuries recorded between 1950 and 2018.



The HAZUS example path for a tornado:

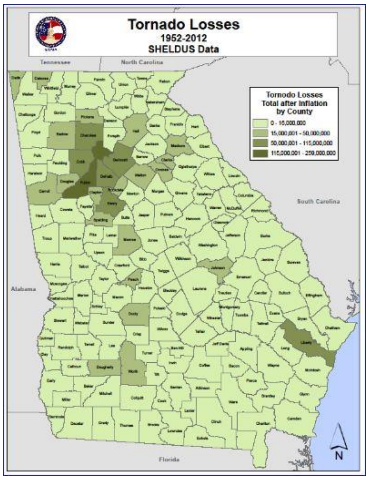


On 4/9/1998, a tornado first touched down just northeast of Pembroke and then crossed I-16 at the Olive Branch Road overpass (about 2 miles west of exit 29) then continued northeast. Significant damage occurred in the Olive Branch Rd. area and also just north of Blitchton, where a 38 year-old female and a 41 year old male were killed along with 15 injured. There were seventy-four (74) homes and other buildings damaged, with fourteen of those destroyed (6 mobile homes, two frame houses, two brick homes, and four other buildings.) Numerous trees were uprooted or snapped off 10 to 15 feet above the ground.

Hazard Frequency Table data is located in Appendix D.

Although in the past 50 years of Bryan County's tornado history, the County has been subject to no greater than a F3 on the Enhanced Fujita tornado scale, based on FEMA's Wind Zones in the United States, winds up to 200 mph are possible in Bryan County, which would include tornadoes with severity up to and including an EF4. All of Bryan County is susceptible to all categories of tornado damage as described in the following table:

Enhanced Fujita Scale		
Category	Wind Speed	Potential Damage
EF0	105–137 km/h 65–85 mph	Light damage. Peels surface off roofs; some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; mobile homes pushed off foundations or overturned; sign boards damaged.
EF1	138–179 km/h 86–110 mph	Moderate damage. Roofs torn off frame houses; windows and glass doors broken; moving autos blown off roads; mobile homes demolished; boxcars overturned.
EF2	180–217 km/h 111–135 mph	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	218–266 km/h 136–165 mph	Severe damage. Some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	267–324 km/h 166–200 mph	Devastating damage. Well-constructed houses and whole frame houses completely leveled; structures with weak foundations blown away some distance; trees debarked; cars thrown and small missiles generated.
EF5	>324 km/h >200 mph	Incredible damage. Strong frame houses leveled off foundations and swept away; with strongest winds, brick houses completely wiped off foundations; automobile-sized missiles fly through the air in excess of 100 m (109 yd); cars thrown and large missiles generated; incredible phenomena will occur.



C. Assets Exposed to Hazard – All structures and facilities within Bryan County could be compromised by a tornado, as tornados are among the most arbitrary of weather phenomena and when or where they strike can be random.

Existing buildings in the tornado hazard area may number up to 26,696 residential, commercial, agricultural, nonprofit buildings, infrastructure facilities, and critical facilities.

Current economic conditions have made it difficult to predict future growth. The table below illustrates the decrease in building permits and the value of construction as reported to the U. S. Census Bureau Data Manufacturing, Mining, and Construction Statistics (www.census.gov/const/www/permitsindex.html). From 2006 to 2010, building permits for new privately owned residential housing units decreased 59.8 per cent. Yet permits that were issued in 2016 amounted to 433, suggesting a rise in growth once again. (https://www.census.gov/quickfacts/table/PST045215/13029)

Population	
Population estimates, July 1, 2016, (V2016)	36,230
Population estimates, July 1, 2015, (V2015)	35,137
Population estimates base, April 1, 2010, (V2016)	30,213
Population estimates base, April 1, 2010, (V2015)	30,238
Population, percent change - April 1, 2010 (estimates base) to July 1, 2016, (V2016)	19.9%
Population, percent change - April 1, 2010 (estimates base) to July 1, 2015, (V2015)	16.2%
Population, Census, April 1, 2010	30,233

D. Estimate of Potential Losses – A severe tornado event could potentially cause severe damages to residents, homes, businesses and critical facilities in Bryan County. The table format from the GMIS system is located in Appendix A. According to the figures provided by the Bryan County tax assessor, a hurricane could potentially impact 24,289 residential structures at an estimated dollar value of $1,850,924,506.

The resident population is ~ 36,082. The number may vary during a standard work weekday versus evening weekend timeframe.

E. Land Use & Developmental Trends – Bryan County is located in wind zone III, which is associated with 200-miles per hour wind speeds. The county currently has

building codes in accordance with the wind zone. Richmond Hill addressed their codes and ordinances recently as well.

F. Multi-Jurisdictional Concerns – All of Bryan County has the same design wind speed of 200 mph as determined by the American Society of Civil Engineers (ASCE). The Unified Development Code was adopted by the county, and includes proper wind strength and safety regulations that are consistent with state and federal regulations. All other jurisdictions have adopted codes that include similar provisions.

In the 2018 Bryan County Hazus report (Appendix A,A) an EF3 tornado scenario was compiled with the path taking it through Pembroke. The estimated damages (none to essential facilities) is as follows:

Table 16: Estimated Building Losses by Occupancy Type

Occupancy Classification	Buildings Damaged		Building Losses
Commerical	23	$	2,085,772
Educational	9	$	2,682,441
Governmental	3	$	47,456
Industrial	6	$	709,557
Religious	15	$	9,305,490
Residential	414	$	15,643,724
Total	**470**	**$**	**30,474,439**

G. Hazard Summary – Due to the threat of a tornado occurrence during a hurricane, coastal storm or thunderstorm event, Bryan County has a fairly high potential for damage from tornados. Bryan County residents need to be prepared for a tornado event as much as is possible. Should a tornado hit certain portions of the county that are highly concentrated with homes, or critical facilities identified, depending upon the strength and duration of the event, significant damage could occur. Due to the indiscriminate and destructive nature of tornados, mitigation actions (found in Chapter 3) related to tornados should be implemented on a countywide basis.

SECTION II – Thunderstorm Wind

A. Hazard Identification – High wind is most commonly found in thunderstorms but can also be without precipitation. Thunderstorms are formed when moist air near the earth's surface is forced upward through some catalyst (convection or frontal system). The moist air rises, the air then condenses to form clouds. Because condensation is a warming process, the cloud continues to expand upward. When the initial updraft is halted in the upper atmosphere, the characteristic anvil shape forms as well as a downdraft. This system of updrafting and downdrafting air columns is termed a "cell". As the process of updrafts and downdrafts feeds the cell, the interior particulates of the cloud collide and combine to form rain and hail which falls when the formations are heavy enough to push through the updraft. The collision of the water and ice particles within the cloud creates a large electrical field that must discharge to reduce charge separation. This discharge is the lightning that occurs from cloud to ground or cloud to cloud in the thunderstorm cell. In the final stage of development, the updraft weakens as the downdraft-driven participation continues until the cell dies. Thunderstorm winds are

generally short in duration involving straight-line winds and/or gusts in excess of 50 mph. Thunderstorm winds tend to affect areas of the county with significant tree stands, as well as areas with exposed property and infrastructure, and above ground utilities. Thunderstorm winds can cause power outages, transportation and economic disruptions, significant property damage, and pose a high risk for injuries and loss of life.

B. Hazard Profile – A prevalent natural hazard event occurring in Bryan County is thunderstorm winds. During the spring and summer months, the county typically experiences countless thunderstorms, some packing significant winds. Over the course of the past twenty years, 66 thunderstorm wind events have been recorded within the county. Significant property damage has been caused by thunderstorm winds. The most prevalent damage caused by the high winds is to trees and power lines. Trees falling on cars, homes, livestock, crops, and buildings are causes of property damage, and power outages.

A summary of the data from the National Climatic Database Center is located in Appendix A. Hazard frequency table data is located in the same appendix as well. Thunderstorm wind as recorded in the NCDC database range from 50 to 65 knots.

The Beaufort wind scale is described below and indicates that Bryan county should mitigate against top winds of a violent storm (Beaufort wind scale of 10-11) as much as is possible.

Specifications and equivalent speeds

Beaufort wind scale	Mean Wind Speed		Limits of wind speed		Wind descriptive terms	Probable wave height in metres*	Probable maximum wave height in metres*	Seastate	Sea descriptive terms
	Knots	m/s	Knots	m/s					
0	0	0	<1	0-0.2	Calm	-	-	**0**	Calm (glassy)
1	2	0.8	1-3	0.3-1.5	Light air	0.1	0.1	**1**	Calm (rippled)
2	5	2.4	4-6	1.6-3.3	Light breeze	0.2	0.3	**2**	Smooth (wavelets)
3	9	4.3	7-10	3.4-5.4	Gentle breeze	0.6	1.0	**3**	Slight
4	13	6.7	11-16	5.5-7.9	Moderate breeze	1.0	1.5	**3-4**	Slight-Moderate
5	19	9.3	17-21	8.0-10.7	Fresh breeze	2.0	2.5	**4**	Moderate
6	24	12.3	22-27	10.8-13.8	Strong breeze	3.0	4.0	**5**	Rough
7	30	15.5	28-33	13.9-17.1	Near gale	4.0	5.5	**5-6**	Rough-Very rough
8	37	18.9	34-40	17.2-20.7	Gale	5.5	7.5	**6-7**	Very rough-High
9	44	22.6	41-47	20.8-24.4	Severe gale	7.0	10.0	**7**	High
10	52	26.4	48-55	24.5-28.4	Storm	9.0	12.5	**8**	Very High
11	60	30.5	56-63	28.5-32.6	Violent storm	11.5	16.0	**8**	Very High
12	-	-	64+	32.7+	Hurricane	14+	-	**9**	Phenomenal

Statistically, Bryan County can expect a high wind storm frequency of 40 percent in any given year based upon historical data.

C. Assets Exposed to Hazard – In evaluating assets that are susceptible to thunderstorm winds, the committee determined that all critical facilities, as well as all public, private and commercial property, are susceptible to thunderstorm winds.

Existing buildings in the thunderstorm wind hazard area may number 24,289 residential, 703 commercial, 26 industrial, 750 agricultural, 293 Religious and non-profit buildings, 539 government, 71 educational, and 25 utilities.

D. Estimate of Potential Losses – A severe thunderstorm event could potentially impact all structures in Bryan County at an estimated total of 26,696 with an assessed value of $3,077,951,450, and exposes ~ 36,082 persons to the wind event. Estimates of potential losses of residents, homes, businesses and critical facilities by hazard were developed from the vulnerability and exposure approach analysis using past hazard data and the mapping tool available with the Georgia Mitigation Information System (GMIS). The spreadsheet format from the GMIS system is located in Appendix D. The Chief Appraiser at the Tax Assessor's Office provided numbers and improved values of structures to prepare estimates of potential losses for each category of structure. (Worksheets 3 are located in Appendix D.)

Bryan County is located in wind zone III, which is associated with 200-miles per hour wind speeds. The county currently has no land use or development trends related to thunderstorms. The local continuous design wind speed in the unincorporated area is 120 miles per hour.

E. Land Use & Developmental Trends – Bryan County and unincorporated Bryan County currently have no land use or development trends related to thunderstorm winds. The County Ordinances require new construction, as well as improvements or repairs upon existing structures, to comply with the Department of Community Affairs Codes as revised 10/13/2011.

F. Multi-Jurisdictional Concerns – All of Bryan County has the same design wind speed of 200 mph as determined by the American Society of Civil Engineers (ASCE). The Unified Development Code was adopted November 18, 2008, and revised 10/13/2011 by the county and includes proper wind strength and safety regulations that are consistent with state and federal regulations. All jurisdictions have adopted codes with similar provisions. Some county and city buildings have been retrofitted to better withstand strong winds. Further accomplishments include implementing the Code Red system for community awareness, educating the public on tornado awareness procedures such as the use of storm shutters, and securing loose objects before they can become projectiles.
As shown on the GMIS maps, the two cities are in different wind zones, and the Bryan County Critical Facilities spreadsheet located in Appendix A will show the critical facilities listed are in wind zones 3, 4, and 5.

While an event with 100% wind damage losses (such as an EF 4 or EF 5) is extremely unlikely to occur and cause harm to the entire county, the tables below demonstrate the catastrophic loss such an event could incur from any related hazard. Nor can it predict how long it would take to clean up and rebuild/recover.

The **Unincorporated Areas of Bryan County**:

	Number of Structures			Value of Structures		
Type of Structure (Occupancy Class)	# in Community of State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area
Residential	16,907	16,907	100.000%	11,277,099	11,277,099	100.000%
Commercial	235	235	100.000%	47,333,885	47,333,885	100.000%
Industrial	16	16	100.000%	23,124,477	23,124,477	100.000%
Agricultural	646	646	100.000%	25,000,000	25,000,000	100.000%
Religious/ Non-profit	221	221	100.000%	17,396,140	17,396,140	100.000%
Government	255	255	100.000%	211,235,670	211,235,670	100.000%
Education	20	20	100.000%	8,393,200	8,393,200	100.000%
Utilities	8	8	100.000%	8,102,940	8,102,940	100.000%
Total	18,308	18,308	100.000%	351,863,411	351,863,411	100.000%

Pembroke:

	Number of Structures			Value of Structures		
Type of Structure (Occupancy Class)	# in Community of State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area
Residential	1,332	0	100.000%	44,623,848	44,623,848	100.000%
Commercial	92	0	100.000%	22,411,808	22,411,808	100.000%
Industrial	3	0	100.000%	64,800	64,800	100.000%
Agricultural	16	0	100.000%	363,510	363,510	100.000%
Religious/ Non-profit	51	0	100.000%	6,272,540	6,272,540	100.000%
Government	167	0	100.000%	45,479,440	45,479,440	100.000%
Education	25	0	100.000%	19,153,790	19,153,790	100.000%
Utilities	15	0	100.000%	8,831,605	8,831,605	100.000%
Total	1,701	0	0.000%	147,201,341	147,201,341	100.000%

Richmond Hill:

	Number of Structures			Value of Structures		
Type of Structure (Occupancy Class)	# in Community of State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area
Residential	6,050	0	100.000%	668,468,475	668,468,475	100.000%
Commercial	376	0	100.000%	150,144,192	150,144,192	100.000%
Industrial	8	0	100.000%	96,419,485	96,419,485	100.000%
Agricultural	88	0	100.000%	703,110	703,110	100.000%
Religious/ Non-profit	62	0	100.000%	29,810,700	29,810,700	100.000%
Government	110	0	100.000%	57,993,010	57,993,010	100.000%
Education	26	0	100.000%	35,180,500	35,180,500	100.000%
Utilities	2	0	100.000%	13,657,532	13,657,532	100.000%
Total	6,722	0	0.000%	1,052,377,004	1,052,377,004	100.000%

Bryan County:

	Number of Structures			Value of Structures			N
Type of Structure (Occupancy Class)	# in Community of State	# in Hazard Area	% in Hazard Area	$ in Community or State	$ in Hazard Area	% in Hazard Area	# in Community or State
Residential	24,289	0	100.000%	1,850,924,506	1,850,924,506	100.000%	0
Commercial	703	0	100.000%	220,330,207	220,330,207	100.000%	0
Industrial	26	0	100.000%	50,643,600	50,643,600	100.000%	0
Agricultural	750	0	100.000%	19,063,105	19,063,105	100.000%	0
Religious/ Non-profit	293	0	100.000%	20,629,312	20,629,312	100.000%	0
Government	539	0	100.000%	310,817,220	310,817,220	100.000%	0
Education	71	0	100.000%	554,899,900	554,899,900	100.000%	0
Utilities	25	0	100.000%	50,643,600	50,643,600	100.000%	0
Total	26,696	0	0.000%	3,077,951,450	3,077,951,450	100.000%	35,137

G. Hazard Summary - Overall, thunderstorm winds pose a great threat to Bryan County in terms of property damage. Thunderstorm winds occur frequently and have the greatest chance of affecting the county each year. Based on the frequency of this hazard, as well as its ability to generate damage anywhere in the county, the hazard mitigation update committee identified critical facilities in need of wind retrofitting as a high priority for implementation.

SECTION III– WILDFIRE

A. Hazard Identification – A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and sometimes consuming structures. Wildfires often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles. Naturally occurring and non-native species of grasses, brush and trees fuel wildfires.

es Image of

A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities.

An urban-wildland interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. A concern for Bryan County is the increasing amount of residential "sprawl" that destabilizes a definitive line between urban/rural areas.

Communities with a large amount of wooded brush and grassy areas are at highest risk of wildfires. Additionally, areas that have experienced prolonged droughts, or are excessively dry, are also at risk of wildfires. *People* start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. *Lightning strikes* are the next leading cause of wildfires.

The Georgia Forestry Commission tracks the following causes of fires: campfire, children, debris burning, incendiary, lightning, machine use, miscellaneous, and smoking.

There are three different classes of wildfires. A "surface fire" is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. A "ground fire" is usually started by lightning and burns on or below the forest floor in the humus layer down to the mineral soil. "Crown fires" spread rapidly by wind and move quickly by jumping along the tops of trees.

B. Hazard Profile –Bryan County has some help from Fort Stewart's Forestry Branch when they regularly conduct prescribed burns to reduce fuel loads which can diminish, and in some cases, prevent, wild fires. They issue warnings for the public in Bryan and nearby counties to alert anyone who might have respiratory problems while also letting the public know that this is an expected and well controlled fire.

The Fire Danger Rating System (FDR) is a measurement used by the Georgia Forestry Commission (GFC) to gauge the behavior of fire before it starts. Fire danger ratings

integrate the effects of fuels, topography and weather into numerical indices that provide an indication of how readily a fire will ignite and of fire behavior (spread intensity) after it starts. FDR is actually NFDRS for National Fire Danger Rating System, which is a system used nationally by all fire agencies.

Fire Danger ratings are calculated on a day to day basis and are subject to change with weather conditions. FDR is classified numerically from 1 to 5 or by using defined color codes.

The classification levels are as follows:

Class day 1 –Low: Fires do not readily start and fires that do start, start slowly with low resistance to control. There is little danger of fire spotting. Prescribed burns can be executed with reasonable safety.

Class day 2 – Moderate: Fires can start from most accidental causes, but the number of starts is generally low. Fires burn at moderate intensities; heavy fuel concentrations will burn hot. Fires are not likely to become serious and control is relatively easy. Prescribed burns can be executed with reasonable safety.

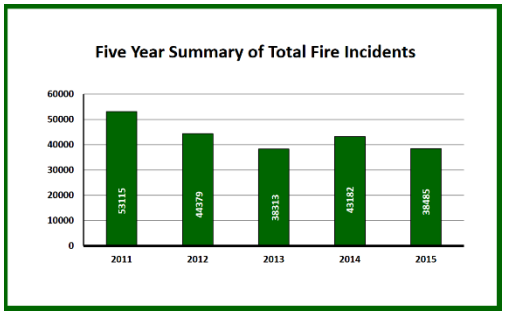
Class day 3 – High: Fires start easily from most causes. Unattended brush fires and campfires are likely to escape. Fires spread rapidly and short distance fire spotting is common. Fires may become serious and their control difficult unless they are attacked successfully while small. Prescribed fire objectives are frequently met on Class 3 days but care must be taken to keep fire within control boundaries.

Class day 4 – Very High: Fires start readily and spread quickly. Spot fires are a constant danger and fire behavior is often erratic. Resistance to control is high, as is the potential for large fires. Site specific conditions and land management objectives may warrant prescribed burning by experts, but care must be taken to keep fire within boundaries.

Class day 5 – Extreme: Fires start and spread quickly and burn intensely. All fires are potentially serious or disastrous. Direct attack of fires is virtually impossible and fires often escape initial attack. Fire behavior is erratic and "blow ups" may be expected. Burn restrictions may go into effect. Experienced professionals may conduct successful prescribed burns after considering site specific fire danger and taking extra precautions to control fire.

The Bryan County Hazard Mitigation Plan Update Committee of 2019 worked with the Georgia Forestry Commission to collect information and formulate mitigation strategies. Data from the Georgia Forestry Commission and the United States Geological Survey Office, Fire Ecology indicates there were 85 wildfires in Bryan County in the past five years. Northern Bryan reported 49 fires involving 237 acres, while the Southern Georgia Forestry section of Bryan County 36 fires. These total 85 fires for the five-year period ending June 2, 2017. The historic frequency for a wildfire event is about 17 per year. The county currently has 13 fire stations serving them.

Bryan County is classified by the Georgia Forestry Commission as having a High Fire Hazard Severity Index. Another index, the Critical Fire Weather Frequency, is 62 days, starting in February to April of each year.

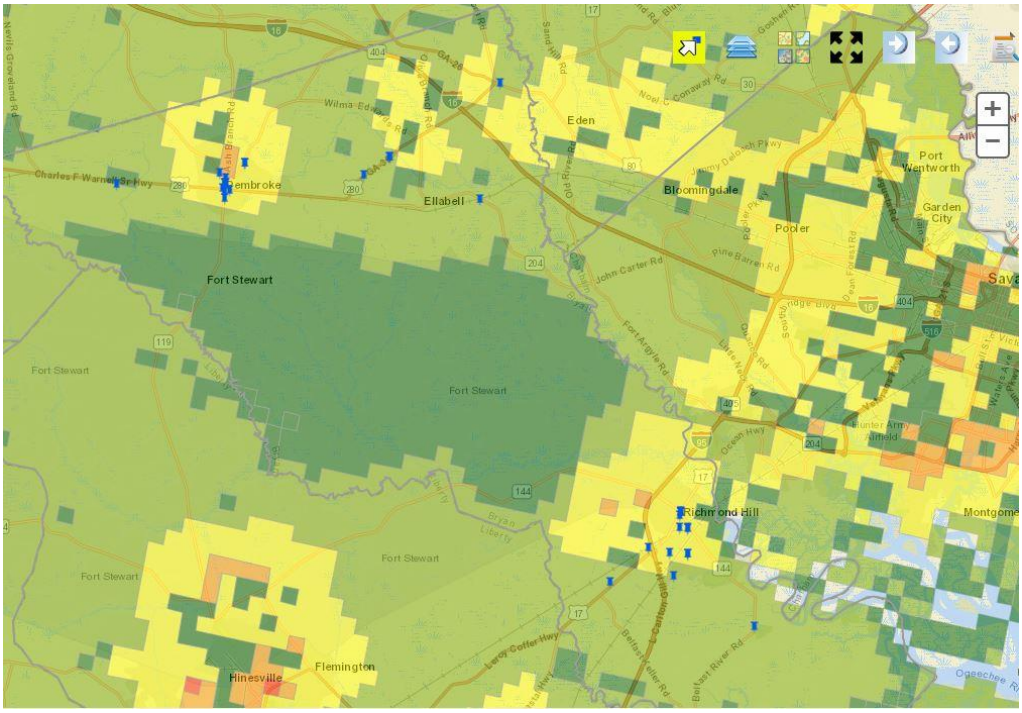


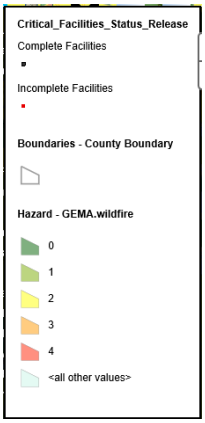
https://www.oci.ga.gov/ExternalResources/Documents/Safety%20Fire/5YearFireServiceAnnualReport_2016.pdf

C. Assets Exposed to Hazard –All areas of Bryan County can be severely damaged by a rural fire spreading into an urban area. Wildfire has not threatened the municipalities often, but fire has occurred in the past. Therefore, in evaluating assets that are susceptible to wildfire, the committee determined that all critical facilities, as well as all public, private and commercial property, are susceptible and at risk.
GMIS lists 7 Critical facilities with a score of 4, 24 with a wildfire score of 3, 2 with a score of 2, and 1 with a score of 1. The Legend is beside map below, and we are awaiting the new CCWP (which as of June 2019 is "in progress") to update these stats.

D. Estimate of Potential Losses – For Bryan County, utilizing the County as a whole, the number of structures in the wildfire hazard area is 26,696 with an assessed value of $3,077,951,450, and exposing 36,082 persons to a wildfire event.

The Bryan County GMIS risk assessment map is below:

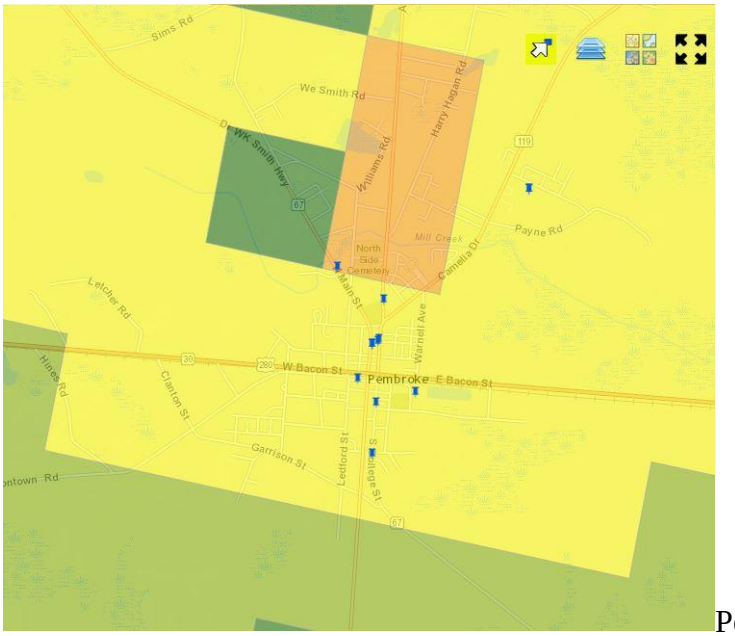




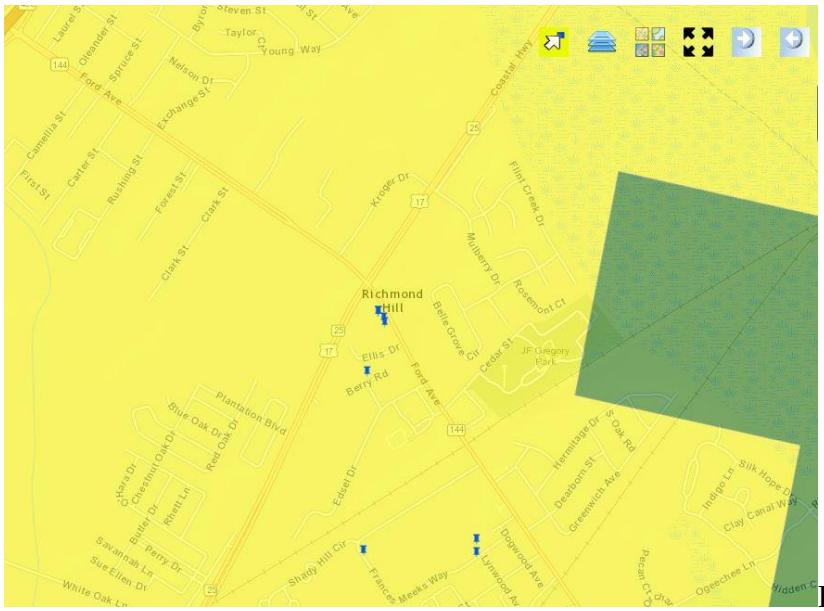
Wildfire Risk Scores The Wildfire Risk Layer was based on the USDA Forest Service, RMRS Fire Sciences Laboratory "Wildland Fire Risk to Flammable Structures, V 1.0" map. Although this data was not intended for use at a detail greater than state-wide analysis, it has been included as the best available data on wildfire risk. The scores are based on the risk value from the original layer.

Score	Original Value	Description
4	5	High
3	4	Moderate
2	3	Low
1	2	Very Low
0	1	No Houses
	7	Agriculture
	8	Water

	9	City



Pembroke



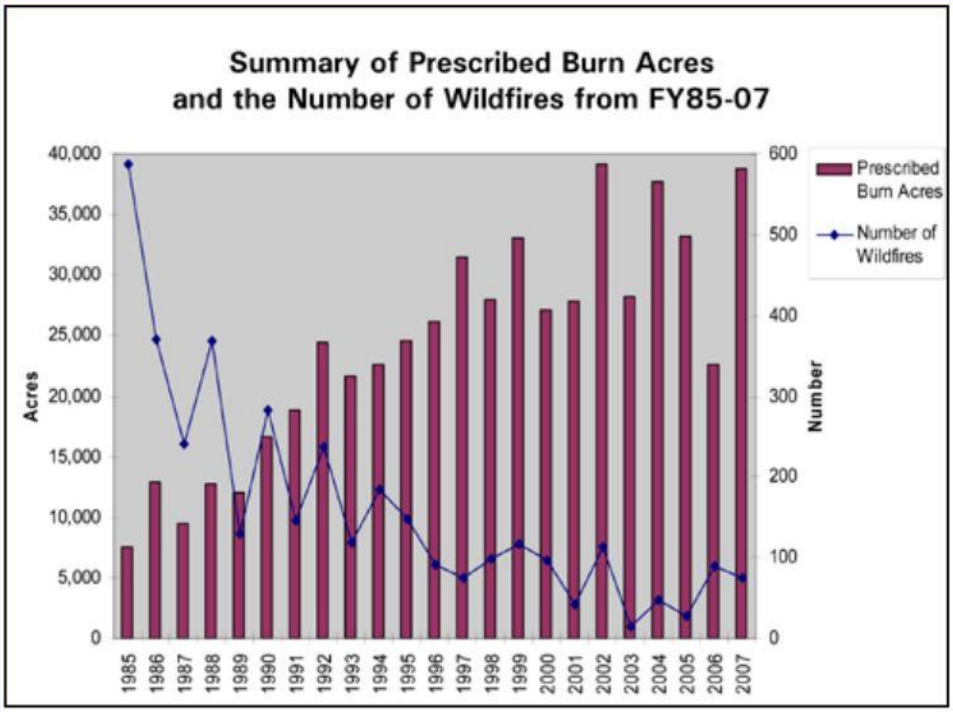
Richmond Hill

Existing buildings in the wildfire hazard area may number over 26,696. These include privately owned, City, County, State, or Federally owned properties within Bryan County. Some necessary infrastructure could be non-functional until relocated or replaced.

E. Land Use & Developmental Trends – All of Bryan County could potentially be affected by the threat of wildfire. Building codes with regard to materials used, or

firebreak measures such as skirting for mobile homes are specified and adhered to within Bryan County.

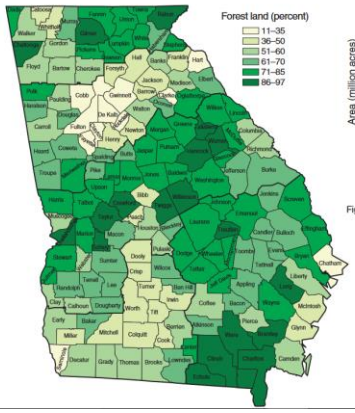
Controlled burning is an avenue being revisited to decrease losses from Wildfires:



While a statewide study has never been conducted, this representative study done at Ft. Benning, GA shows a significant reduction in wildfires concurrent with an increase in prescribed burning.

Detailed jurisdictional information will be available with the Community's Wildfire Risk Assessment. Jurisdictional mitigation efforts will be addressed in the Community Wildfire Protection Plan. The Georgia Forestry Commission is in the process of updating Bryan County's Fire Wildfire Risk Assessment. This assessment includes enhanced mapping features that will be published in the Community Wildfire Protection Plan. This plan will provide for greater mitigation efforts in future Hazard Mitigation Plan Updates.

From 71 – 85% 0f Bryan County is forested.



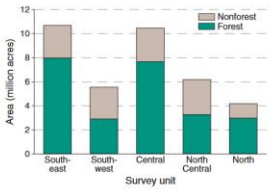


Figure 3—Forest land area by survey unit, Georgia, 2014.

Two land use change trends stand out in Georgia from 2004 to 2014. The rate at which the State gained forest land acreage (from converted agricultural land) decreased until 2009 and after that time remained stable. And the rate at which forest was lost to development decreased steadily since about 2007.

F. Multi-Jurisdictional Concerns – Most of the wildfire danger is in unincorporated areas of the county, but as lightning strikes can cause a wildfire in any location, any mitigation steps taken related to wildfire should be undertaken on a countywide basis and include the Cities of Pembroke and Richmond Hill.

The maps on page 36 of this chapter depict the GMIS declared areas of fire risk by rank. One area on the north end of Pembroke is in a high fire risk rating.

The land area West of Bryan County is Fort Stewart which does regular controlled burns to greatly reduce wild fire fuels, and would assist Bryan County in fire suppression should the need arise.

Georgia Forestry divides Bryan County into two sections: Northern Bryan reported 49 fires involving 237 acres, while the Southern Georgia Forestry section of Bryan County lists 36 fires. These total 85 fires for the five-year period ending June 2, 2017.

G. Hazard Summary – As the majority of Bryan County is forest, wildfire continues to be a critical threat and remains a frequently occurring hazard. Wildfire threatens not only structures, but the health and safety of county residents, and continuity of functions. Forestry is a vital element of the county's economy as well. Due to the destructive nature of wildfires, the committee feels that mitigation strategies for reducing the likelihood or impact of wildfire are critical to the health and safety of Bryan County residents, their property, and their means of income.

CHAPTER 3 – MITIGATION STRATEGY

Chapter 3 Section	Updates to Section
II. Action steps	● Steps relative to all hazards are in the first grouping
Natural Hazard A -***Coastal Storms***	• Now found in Water group, New data & action steps added
Natural Hazard B -***Drought***	• Now found in Water group

Natural Hazard C -***Flooding***	• Water, New data added for occurrences, and NFIP
Natural Hazard D - ***Hurricanes***	• Wind, New data added
Natural Hazard E -***Tornadoes***	• Wind, Data updated
Natural Hazard F -***Wildfire***	• Fire data added, action steps added

Overview of updates to Chapter 4: Local Natural Hazard Mitigation Goals and Action Steps

This chapter for the 2019 plan update takes on a slightly different form in accordance with Georgia Emergency Management Agency's template, and to lessen the amount of redundancy; hazard action steps were grouped as All Hazards, Water, Wind, and Fire. As the frequency of events, and damages from these events evolved, the steps were updated when necessary as to their priority within the plan. More wind and water damage has been seen in more recent years.

I: Introduction to Mitigation Strategy

All datasets were updated to 2008-2018 statistics and events (where data existed) and narrative sections were updated to reflect current evaluations. Public input was often sought during these updates. All meetings were open to the public, and the draft of the plan was posted on the Bryan County website with reference made to it in the local newspaper.

The 2019 Hazard Mitigation Plan Update Committee has gone over each Action Step the county and cities wish to take, and the steps are updated utilizing STAPLEE criteria (as per FEMA guidance), and listed whether that step was completed, deleted, or is Ongoing. We also reviewed and restated each step's priority to reflect current events, budgetary restrictions, and environments.

Committee members identified many strategies they felt would benefit the community, and sought input from the various county and city emergency services, and Bryan County citizens that they may read, review, and contribute additions and corrections in areas which they had current knowledge. This participation was sought to increase input into strategy development from community residents, elected officials and staff from local and state agencies. The public was invited to participate in the draft document's approval at a public meeting in Pembroke on January 29th, 2019 for attendees and for those who could not either attend previous meetings, or read the draft on the county website. The emphasis at this meeting was to gain input on the action steps; which were approved again. And the public was reminded that plan action step reviews will occur at least every five years and after each future major hazard event is debriefed.

II. – Capability Assessment:

Bryan County, the unincorporated areas, and the cities of Pembroke and Richmond Hill all have diverse geography, budgets, and needs. The governing systems being independent of one another in many areas stressed the need to communicate through phone calls, meetings, e-mail, website updates, and public notices to gather the action step data. In the case of public meetings, invitations were also sent to ensure the input necessary to have a comprehensive list of both Goals and Action Items to better meet the needs of all citizens possible. The goals, and action steps developed by the Bryan County original Hazard Mitigation Planning Committee, and 2019 Plan Update Committee collectively are

contained herein. As Bryan County, Pembroke, and Richmond Hill address other plans and improvements to their websites, more citizen interaction is bringing on more changes toward being more resilient and quicker to recover after these hazard events.

GOAL: Water-1
Minimize losses to existing and future structures, especially critical facilities, due to the flood waters that may be caused by flash floods
GOAL: Water-2
Minimize losses to existing and future structures, especially critical facilities, due to the flooding that may be caused by coastal storms
GOAL: Water-3
Minimize losses to existing and future structures, especially critical facilities, due to the flooding that may be caused by forces secondary to hurricanes
GOAL: Water-4
Reduce economic impact of drought conditions on Bryan County

GOAL: Wind-1
Minimize damages from high winds resulting from hurricanes
GOAL: Wind-2
Minimize destruction from tornado winds

GOAL: Wind-3
Lessen damage to life, health and property of residents from high winds from severe winter storms, windstorms and coastal storms.

GOAL: Fire-1
Reduce damage within Bryan County caused by wildfire events by minimizing the threat of wildfire occurrence during periods of drought
GOAL: Fire-2
Reduce damage caused by wildfire in Bryan County. Reduce losses in forests, structures, and many other assets.
GOAL: Fire-3
Educate the public with regard to fuel loads, their proximity to structures, and the judicious use of controlled burns.

GOAL: All Hazards **Establish and maintain conservation and protection of natural areas which would be endangered by development. These areas include, but are not limited to, floodplains, wetlands, groundwater recharge areas and protected river corridors.**

Priority status for each action item has been listed as High, Medium, or Low. High priority was issued by the committee for those action steps that would show the most cost-benefit for the County and its jurisdictions should funding be obtained. Medium Priority was given to those which would simply be helpful over all. Low priority was

listed for those action steps not within control of local government entities, but are encouraged by them.

Bryan County chose top delete the following steps from the previous plan as no longer relevant:

- Encourage use of ponds and surface water for irrigation
- Review building and zoning requirements and add, if deemed necessary, regulations for an urban interface
- Educate boat owners on proper boat safety, tie down procedures by supplying information with boat registration as well as on applicable websites

The first action steps listed will be applicable to all hazards addressed in this 2019 Plan Update.

Goal	Action Step	Lead and Supporting Agency, Department, organization	Anticipated Cost	Funding Sources	Jurisdiction	Time-frame/ Priority	Status Deferred, Ongoing, or New)	Hazard Addressed
All (Water 1-4, Wind 1-3, Fire 1 -3	Action #1 Have up to date natural hazard brochures & fact sheets to distribute for student and citizen education to increase public awareness and cooperation	Bryan County EMA. GA Forestry, FEMA, GEMA, DNR, etc.	Man Hours and printing/ shipping costs	All available	All (Bryan County, Pembroke, Richmond Hill, & all unincorporated areas)	2019-2020 Medium	Updated as needed	All
All	Action #2 Enforce existing ordinances aimed at protecting life and property from natural hazards	Planning & Zoning, EMA, FD's, GA Forestry	Man hours	Local govts.	All	2019-2020 High	Ongoing	All
All	Action #3 Consider a *cooperative* City, County, and Local Business Emergency Planning Group for pre and post disaster planning utilizing frequent, sustainable briefings surrounding hazard events	Bryan County EMA and Bryan County administration	Man hours	Bryan County Commissioners	All	2019-2020 Medium	As needed	All
All	Action #4 Purchase up-to-date communications equipment (radios, phones, or tablets, batteries and chargers) which have multi-channel capabilities	911 Director and County EMA	$26,500	Sheriff's office, Fire Grants	All	2019-2020 High	As needed when funds are available	All
All	Action #5 Purchase portable generators and trailers for use (as needed) at critical facilities and vulnerable citizen facilities	County EMA, Commission, and City Councils	$60,000	Bryan County and all cities	All	2019-2020 High	In process	All
All	Action #6 Evaluate & obtain an advanced warning system to alert citizens of impending natural disasters (Code Red?)	County EMA and City Councils	$53,000	Grants and general funding	All	2019-2020 High	In place Replace when outdated	All

Goal	Action Step	Lead and Supporting Agency, Department, organization	Anticipated Cost	Funding Sources	Jurisdiction	Time-frame/ Priority	Status Deferred, Ongoing, or New)	Hazard Addressed
All	Action #7 Provide current First Responder Training (CERT) for citizens as needed	Bryan County EMA, local jurisdictions, and GEMA	Staff time	GEMA	All (Bryan County, Pembroke, Richmond Hill, & all unincorporated areas)	2019-2020 Medium	Ongoing	All
All	Action #8 Review, update and add any necessary floodplain, zoning, and building ordinances and regulations. Add, if necessary, proper elevations, setbacks and restrictions	County Commission, Administration and City Councils	Man hours	General Funds	All	2019-2020 High	In Process	All
All	Action #9 Increase public awareness of evacuation routes, safety procedures, and other disaster plans by publishing articles in the local newspaper, holding town hall meetings and providing bulletins to local churches and the schools	County EMA	$10,600	General Funds	All	2019-2020 High	Ongoing	All
All	Action #10 Increase Public awareness of the assistance that the local Emergency Management Agency can provide	County EMA	Man hours	General Funds	All	2019-2020 High	Ongoing	All
All	Action #11 Update and coordinate all Emergency Response Plans on an annual basis	County EMA	Man Hours	General funds and Grants when possible	All	Each Year High	Ongoing	All
All	Action #12 Update community evacuation plans to reflect population changes and longer evacuation timeframes. Add additional routes if necessary	Bryan County EMA and local govts.	~$26,500	General Funds	All	Update each year Medium	Ongoing	All
All	Action #13 Review/update building codes and zoning regulations and add, if necessary, proper elevations, setbacks and restrictions as the population of Bryan County continues at its present high growth rate	Bryan County and its municipalities Building and planning departments	In-kind staff hours	General funds	All	Update as regulations are revised Medium	Ongoing	All
Goal	**Action Step**	**Lead and Supporting Agency, Department, organization**	**Anticipated Cost**	**Funding Sources**	**Jurisdiction**	**Time-frame/ Priority**	**Status (Deferred, Ongoing, or new)**	**Hazard Addressed**

All	Action #14 Update Comprehensive Plan	North and South Bryan County	Staff Hours	General Funds	All	Slated for adoption early 2019 Medium	Completed Oct. 2018	All
Water 1-4, Wind 1-3, Fire 1-3	Action #15 Seek funding to implement an emergency public notification method	Bryan County EMA	Staff hours	General Funds	All	Completed (SMS Text Alerts) Low	Completed	All
Water 1-4, Wind 1-3, Fire 1-3	Action #16 Update and coordinate all Emergency Response Plans, and conduct tabletop exercises to test efficiency, and improve upon any weak areas	Bryan County EMA	Staff hours	General Funds and Grants (as available)	All	2019-2020 Medium	As Needed	All
Water 1-3, Wind 1-3 and Fire 1-3	Action #17 Encourage the trimming of trees around roads, homes, utilities, and businesses to reduce high-wind projectiles and fuel loads	Bryan County EMA, and all property owners	Staff hours	General Funds and volunteers	All	Each Year High	Ongoing	All
Water 1, 2, 3	Action #18 Seek updated FIRM maps	State/Federal and County Extension service	N/A	N/A	All	Completed 05/05/2014, 03/02/2009 (RH) Low	Completed	Water
Fire 1, Water 4	Action #19 Seek funding to install at least 25 more dry hydrants in populous areas	County EMA and all Fire Stations	$15,900	General Funds & Grant money	All	2019 Medium	As needed	Wildfire
Fire 1	Action #20 Seek funding to extend the depth of existing wells in both cities for irrigation and fire suppression	County EMA & City Fire Departments	$26,500	DCA and block grants	Pembroke and Richmond Hill	2018-2020 Medium	In Process	Fire, drought
Fire 1	Action #21 Seek funding to acquire additional fire tankers (2000 to 3000 gallons) for local fire departments	Bryan County Fire Departments	$1,060,000	Capital Improvement Plan Grants	All	2019-2020 Medium	In Process	Fire Drought
Fire 2	Action #22 Increase public awareness of wildfire dangers around the home and community, and the process for obtaining burn permits by publishing articles in the local newspaper, holding town hall meetings, radio announcements and providing bulletins to local churches and schools	Georgia Forestry Office and local entities	Staff hours	State of GA and local man hours	All	Each year High	As Needed with an emphasis during drought periods	Fire Drought
Goal	**Action Step**	**Lead and Supporting Agency, Department, organization**	**Anticipated Cost**	**Funding Sources**	**Jurisdiction**	**Time-frame/ Priority**	**Status (Deferred, Ongoing, or New)**	**Hazard Addressed**
Water 4 Fire 1 & 2	Action #23 Educate public during periods of drought; reduced external burning and water use during drier months	County Extension Service and Natural Resources Conservation Service	$10,600	State and Federal Grants	All	Each Year High	Ongoing	Drought and Fire
Water 4 Fire	Action #24 Increase public awareness campaigns for water conservation issues by publishing articles in the	Bryan County EMA/FD, Bryan County	$2,650	Local printing budgets	All	Each year Medium	Ongoing	Drought and Fire

1 & 2	local newspapers, bulletins in county schools, brochures at local government buildings, and in appropriate areas on the county website	and its municipalities						
Water 1-4	Action #25 Assess storm water run-off and watershed plans and evaluate effectiveness of present drainage systems.	Bryan County Public Works & Water Depts.	Staff hours	General Funds	All	Each year Medium	In Process	Water
Water 1-4 Fire 1	Action #26 Promote preservation of wetland areas to assure that excess water can be captured.	Bryan County Dept. of Public Works	$106,000 and staff hours	State & Federal Grants, General Funds	All	Each year High	Ongoing With growth	Water and Fire
Water 1-4	Action #27 Promote the construction of storm water retardation facilities, storm drain improvements and channel improvements to protect existing and new developments	Bryan County, Pembroke, and Richmond Hill	Staff hours	General Funds	All	Each year High	Ongoing	Water and Fire
Water 1-4	Action #28 Seek funding for a portable generator (and all adaptors) to provide interim power to reestablish critically necessary functionality to the water tower	Bryan	$60,000	Grant funding	All	Each year High	In Process	Water, Wind and Fire
Water 1-4	Action #29 Seek funding for a portable generator (and all adaptors) to provide interim power to reestablish critically necessary functionality for the lift stations	Bryan	$60,000	Grant funding	All	Each year High	In Process	Water, Wind and Fire
Goal	**Action Step**	**Lead and Supporting Agency, Department, organization**	**Anticipated Cost**	**Funding Sources**	**Jurisdiction**	**Time-frame/ Priority**	**Status (Deferred, Ongoing, or New)**	
Water 1-3	Action #30 Work towards creating local ordinances allowing for wider easements to keep drainage ditches and culverts accessible for maintenance.	Bryan County, Pembroke, Richmond Hill	Staff hours	General Funds	All	2019-2020 Medium	In Process	Water
Water 1-3	Action #31 Seek funding to improve the functionality of run-off and water retention ditches.	Bryan County, Pembroke, Richmond Hill	≥ $265,000 (Grant Estimate)	Grant Funding	All	2019-2025 Medium	In Process	Water
Water 1-4 Fire 1-2	Action #32 Promote the preservation of areas in and around watercourses.	Bryan County and GA DNR	~ $5,300 (printing materials)	General Funds, State Contribution	All	Each year Medium	With each new applicable plan or ordinance	Water and Fire
Water 1-4 Fire 1-2	Action #33 Promote the preservation and restoration of wetland areas	Bryan County and GA DNR	~ $5,300	General Funds	All	Each year Medium	In Process	Water and Fire
Water 1-3	Action #34 Seek funding to acquire flood area (already leveled)	Bryan County and Richmond Hill	$1,060,000	Grant funding	Bryan County and Richmond Hill	2019-2025 Low	In Process	Water

	properties and convert to low impact uses such as recreation areas							
Water 1-3	Action #35 Seek funding to relocate critical facilities from known flood areas.	Bryan County EMA and Richmond Hill	≥ $200,000	Grant Funding and General Funds	Bryan County and Richmond Hill	2019-2025 High	In process	Water
Wind 1-3	Action #36 Seek funding to retrofit public buildings to reinforce windows, roofs, and doors	Bryan County and EMA	≥ $600,000	Grant funding	All	Review each year Medium	In Process	Wind
Water 1-3, Wind 1-3	Action #37 Increase public awareness of evacuation routes and safety procedures by publishing articles in the local newspaper, on the county website, holding town hall meetings, and providing bulletins to local churches, clubs, and the schools	Bryan County EMA	Staff hours	General Funds	All	Each year Medium	Ongoing	Wind and Water
Wind 1-3	Action #38 Encourage a subdivision requirement to place all utility lines underground	Bryan County, Pembroke, Richmond Hill	Staff hours (ordinance updates)	General Funds and private developers	All	2019-2020 Low	In Process	Wind
Goal	**Action Step**	**Lead and Supporting Agency, Department, organization**	**Anticipated Cost**	**Funding Sources**	**Jurisdiction**	**Time-frame/ Priority**	**Status (Deferred, Ongoing, or New)**	**Hazard Addressed**
Wind 1-3	Action #39 Encourage installation of stronger windows, roofs, doors, and/or permanent shutters on standard windows	Bryan County, Pembroke, Richmond Hill	Staff hours (ordinance updates)	General Funds	All	2019-2020 Low	In Process	Wind
Fire 1-3	Action #40 Seek state and federal grants to acquire current PPE and SCBA equipment and ensure its maintenance	Bryan County FD	~$16,000	Grants, General Funds, & Capital Funds	All	Annual Review of inventory High	In Process	Fire
Fire 1-3	Action #41 Improve public awareness of wildfire techniques such as putting out small fires with a garden hose, safe techniques for private property, controlled burns, and the importance of fire buffers around the home, by publishing articles in the local newspaper, on the county website, radio announcements and providing bulletins to local churches & schools	GA Forestry Bryan County FD	~$11,000	State	All	Each year Medium	In Process	Fire
Fire 1-3	Action #42 Request that Georgia Forestry update signs to roadways that would give status of local burning conditions	GA Forestry	~$15,000	State	All	Each year Medium	In Process	Fire
Fire 1-3	Action #43 Improve wildland fire training at the local fire department level.	Bryan County, Pembroke, and Richmond Hill	Staff hours	General Funds	All	Each year High	In Process	Fire
Water 1-3	Action #44 Clear 20 miles of Pembroke canals to draw water away from residential areas as well as controlling vector borne threats from mosquitos breeding in standing water	Pembroke	Staff hours	General Funds	Pembroke	2019 and forward Medium	Begun in Dec 2018 and ongoing	Flood and vector borne illness
Fire 1-3	Action #45 Seek grant funding for an additional well pump	Bryan County Engineering Dept.	$25,000	Grant	All	2019 High	Begun in 2019 and	Drought and Fire

							in process	
All	Action # 46 Increase Public awareness of the new emergency public notification method, weather radio systems, and Community Safe Shelter	Bryan County Public Safety	Staff hours	General Funds	Bryan County, Pembroke & Richmond Hill	2014 Medium	Complete d	Water, Wind and Fire

SECTION I – WATER: Coastal storms, Hurricanes, Drought, and Flooding

Bryan County: Is currently NFIP compliant and the County, the Bryan County Emergency Management Agency (BCEMA) manages the flood warning system and maintains web-posted evacuation routes.

Pembroke: Is currently NFIP compliant and in May of 2017 received its CRS class 9 rating which will be renewed each October as long as no new CRS activities are added, and the community continues to implement the current activities, as well as improvements to its canals.

Richmond Hill: The city of Richmond Hill has a comprehensive webpage of resources for reducing damage prior to, and during flood water events, NFIP information, and is included in the Bryan County flood warning system.

Natural Hazard A: Coastal Storms

A. Mitigation Goals – Utilizing the definition of this hazard as described in Chapter 2, Sections 1, the Bryan County Hazard Mitigation Plan Update Committee developed the goal of reducing the damages which coastal storms and storm surge in Bryan County could have on the local economy (possibly displacing people, poultry, livestock, damage to crops, structures, and the ability to traverse roads and bridges that may be blocked by fallen trees, power lines, and/or standing water) and the capacity to keep power flowing to all areas of the county.

B. Range of Mitigation Options - The Bryan County Plan Update Committee identified structural and non-structural mitigation measures to ensure that the community adequately addresses relevant coastal storm disaster issues. These measures seek collaboration with federal, state, and local agencies, (conservation of water resources, the quality of the potable water, et. al.) and educational efforts through the local county agencies. The proposed strategies hold no inherent risk for historic or other special considerations in the community, and are in harmony with other Bryan County Plans and Procedures.

C. Mitigation Strategy for Coastal Storms – Action steps with regard to Coastal storms are found in #1-17, and #25-30, & 34-39.

D. Multi-Jurisdictional Considerations – Coastal storm conditions affect all of Bryan County. Critical facilities and vulnerable populations are located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. Alerting all residents of impending high winds and potential flooding conditions is a county-wide concern. Any mitigation steps taken related to coastal storms should be undertaken on a countywide basis and include the Cities Pembroke and Richmond Hill. As Richmond Hill is coastal, efforts

to continually update their County webpages and numerous interactive links and services for flooding and stormwater are exceptionally helpful to new and established citizens.

E. Education & Awareness – The Bryan County Hazard Mitigation Planning Committee has identified several methods of public education and awareness regarding hazard mitigation. All public information efforts are also aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature, listed on pages 2-6, and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles and bulletins concerning updated and/or additional county evacuation routes and pro-actively pursue, and add to their website, new data as it becomes available.

F. Completed and deleted steps from original plan – The action step directing the need to update FEMA FIRM's had been completed since the plan's previous update. No deletions were needed and this step was marked as completed. The Bryan County Comprehensive Plan was also updated in October of 2018 and that action step marked as completed.

G. Unchanged steps – Most of the action steps listing 'ongoing or 'in place' are those steps that are necessary for a dynamic population showing continuous growth. A large part of the changes in Plan Update guidance were in relation to these steps, (the addition of responsible department, funding estimate and potential source, and time range to start and complete) and were discussed within the Plan Update committee members and added at that time.

Natural Hazard B– DROUGHT

A. Mitigation Goals – As denoted in Chapter 2, Section II, drought conditions can negatively impact a local economy by having a deleterious effect on several industries (especially agricultural economies) that is two-fold. The obvious direct effect is the loss of water to crops and livestock, but the greatest threat to Bryan County stemming from drought is that of potential wildfires. Much of the county is made up of forested areas and woodlands. Fires in these areas are generally the result of dry conditions combined with lightning or human error. The plan update committee has determined that drought conditions needed to be mitigated through efforts in the reduction of wildfires, as well as methods to both expand and control water sources.
Ft. Stewart has its own Fire Department that cooperates with Bryan County with regard to prescribed burns and citizen education. The State of Georgia monitors drought conditions and publicizes water conservation dictates as they are deemed fitting.

B. Range of Mitigation Options - The Plan Update Committee has identified both structural (e.g. deeper wells) and non-structural mitigation measures in hopes of minimizing the potentially destructive effects of drought and drought-inflicted wildfires. The plan update committee's focus is on enhancing the preservation of life and property, with particular emphasis on vulnerable populations and critical facilities. Suggested measures may result in modifications to current policies and the implementation of local ordinances to ensure suggested mitigation measures are initiated. The proposed strategies hold no inherent risk for historic or special considerations in the community yet do take into consideration the needs and location of vulnerable populations and are in harmony with other Bryan County Plans and Procedures. Drought itself is not a factor in steps that would involve modifications in either existing, nor new buildings and infrastructure.

C. Mitigation Strategy for Drought – The Plan Update committee developed the following strategies for the specific need to protect commodities from an adverse impact upon the county economy, and especially the livelihoods of those in agricultural and livestock business endeavors. Action Steps #1-3, 8-10, 14, 20-24, 27, 32-33, 41, and 42 address these concerns.

D. Multi-Jurisdictional Considerations – Drought conditions affect all of Bryan County, and those vulnerable populations located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. As a result, any mitigation steps taken related to drought and drought inflicted wildfires should be undertaken on a countywide basis and include the Cities Pembroke and Richmond Hill.

E. Education & Awareness – The Bryan County Hazard Mitigation Plan Update Committee has continued to identify several methods of public education and awareness regarding hazard mitigation. All public information efforts are aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles and bulletins concerning wildfire dangers after pro-active pursuit of all new available data.

F. Completed & Deleted Action Steps - The committee decided to keep all existing action steps for this hazard. No action step for drought was designated as complete due to the nature of droughts in the County and the inability to predict with certainty these types of events.

G. Unchanged Action Steps – The verbiage, and the addition of responsible department, funding estimate and potential source, and time range to start and complete were decided upon by the Plan Update committee and added per new requirements.

Natural Hazard C – FLOODING

A. Mitigation Goals – As noted in Chapter 2, Section III, flooding has caused and continues to cause significant damage all through the years in Bryan County. There are two or more locations throughout the county where localized flooding is continuously a problem during heavy rains. Mitigation strategies which reduce the negative effects of flooding must be considered.

B. Range of Mitigation Options - The suggested mitigation options to reduce the effects of flooding in Bryan County include new policies and procedures, enhanced data collection and efforts to reduce localized flooding. The community has identified both structural and non-structural mitigation efforts to reduce the future impacts of floods on Bryan County.

C. Mitigation Strategy for Flooding – Action steps with regard to minimizing flood damages are: #1-18, 25-35, and 37.

D. Multi-Jurisdictional Considerations – Flooding issues can be the result of several hazard events each having county-wide consequences. Although some flooding issues are localized, as along the low-lying areas along Highway #144 or surrounding Medway River or the Ossabaw Sound or from storm surge events in the far eastern portion of the County, conditions affect all of Bryan County. Critical facilities and vulnerable populations are located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. As a result, both the structural and non-structural mitigation steps listed here should be undertaken on a countywide basis and include the Cities Pembroke and Richmond Hill.

E. Education & Awareness – The Bryan County Hazard Mitigation Plan Update Committee has identified several methods of public education and awareness regarding hazard mitigation. All public information efforts are aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis signal or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles and bulletins concerning flooding dangers, or any other active weather alert. Richmond Hill has a comprehensive web presence geared for citizens with regard to flood awareness and active mitigation.

F. Completed & Deleted Action Steps – The plan update committee was pleased to see that the Bryan County; 05/05/2014, and Richmond Hill; 03/02/2009 FEMA FIRM's were

updated, and presented to the public. In addition, the County has included the Bryan County Joint Comprehensive Plan 2018 , which will further ask for input from the citizens for that plan, and the consideration of a Regional Water Plan. Those steps having been completed; no other action steps needed removal.

G. Unchanged Action Steps – A large part of the changes in plan update guidance were in relation to these steps (the addition of responsible department, funding estimate and potential sources, and time range to start and complete) were discussed in Plan Update meetings and added at the first update, with completion dates updated.

Natural Hazard D – HURRICANES

Irma; "Sept. 7, 2017: Gov. Nathan Deal issues a mandatory evacuation beginning at 8 a.m. on Sept. 9 for all Georgia residents living east of I-95. It approached several Caribbean islands as a Category 5 storm, and several projections had showed it turning north along the eastern coast of Florida and making landfall in the Savannah area as a Category 4 storm at the least. (More than 16,000 customers were reported without power after the storm passed.)

& Matthew; Hurricane Matthew, as a comparison, which caused major damage across Bryan County and the surrounding area last October, was a weak Category 1 storm, meaning it had winds of between 74 and 95 mph."

Mulberry was one of just several neighborhoods to experience flooding during Hurricane Irma.

Most Hurricane Michael (in 2018) damages were NW of Bryan County which is why it is not included here.

A. Mitigation Goals – Hurricanes, as seen recently above, pose great danger to the life and property of the residents of Bryan County. These tremendous storms create damage from high winds, heavy rainfall, storm surge, and possible tornadoes. These events, in turn, create coastal erosion and flooding damages, as well as tremendous property damage, and worst case, deaths.
Mitigation measures reflect the efforts of the Bryan County Hazard Mitigation Plan Update Committee to reduce destruction from the high winds and flooding conditions.

B. Range of Mitigation Options - The Bryan County Hazard Mitigation Plan Update Committee identified both structural and non-structural mitigation measures to ensure that

the community adequately addresses relevant issues that could be created by a hurricane event. Structural measures include retrofitting critical facilities to better withstand storm winds. Non-structural measures included assessing storm water runoff issues. Suggested mitigation measures may result in alterations to current land use policies and building codes, if necessary; to ensure that proper mitigation measures are undertaken. The proposed strategies hold no inherent risk for historic or other special considerations in the community, take into consideration the needs and location of vulnerable populations, and are intended to be compliance with other Bryan County Plans and Procedures.

C. Mitigation Strategy for Hurricanes - Action Steps relating to flood are: #1-18, 25-35, and 37.

D. Multi-Jurisdictional Considerations – Hurricane conditions could affect all of Bryan County. To help with the elimination of rainwater/floodwater, Chapter 6, Sec 6-107, 10, B of the Bryan County Code of Ordinances makes it: "unlawful for any person to throw or deposit any solid wastes, trash or debris in any marsh area, stream, and drainage ditch, body of water or beach area."
Critical facilities and vulnerable populations are located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. Alerting all residents of impending high winds and potential flooding conditions is a county-wide concern. As the SE section of Bryan County is coastal, storm surge has been addressed. All mitigation steps taken related to hurricane events should be undertaken on a countywide basis and include the Cities Pembroke and Richmond Hill.

E. Education & Awareness – The Bryan County Hazard Mitigation Planning Committee has identified several methods of public education and awareness regarding hazard mitigation. All public information efforts are also aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles, alerts on the county website, and bulletins concerning updated county evacuation routes.

F. Completed & Deleted Action Steps – The plan update committee was pleased to see that the 1988 FEMA FIRM's were updated and presented to the public. In addition, the County has updated, in 2018, the Bryan County Comprehensive Plan.

G. Unchanged Action Steps – A large part of the changes in plan update guidance were in relation to these steps: the addition of responsible department, funding estimate and

potential source, and time range to start and complete, and were discussed in Plan Update meetings and added at this time.

With regard to notification systems, "Bryan County Emergency Management Agency (BEMA) uses CodeRED to send EMERGENCY notifications by phone, email, text, and social media to keep citizens informed of emergencies such as an evacuation notices, utility outages, water main breaks, fire or floods, chemical spills, or other emergency situations." Action steps to have improved or additional systems as they become available remain.

Natural Hazard E – TORNADOES

A. Mitigation Goals – The potential for injury, loss of life, and property damage caused by a tornado event in Bryan County is great. The threat of a tornado event can come from many of the other hazard events that have an undesirable impact on the county, including hurricanes, thunderstorms and wildfires. Therefore, the committee identified several measures to reduce the impacts from these deadly events.

B. Range of Mitigation Options - The Bryan County Hazard Mitigation Plan Update Committee identified both structural and non-structural mitigation measures to ensure that the community adequately addresses relevant issues which could possibly occur in a tornado event. Structural measures include retrofitting critical facilities to better withstand tornadic winds to keep damages to a minimum, and developing a community safe shelter program.

Several non-structural measures were identified to ensure that proper mitigation measures are undertaken. The proposed strategies hold no inherent risk for historic or special considerations in the community but do take into consideration the needs and location of vulnerable populations, and are in harmony with other Bryan County plans and procedures.

C. Mitigation Strategy for Tornadoes - All Action Steps involving Wind Goals and Hazards.

D. Multi-Jurisdictional Considerations – The County currently has no tornado warning system other than to send the text messages to those who have elected to receive them. Installation of a siren system could also be used in the event of other natural hazards. Tornado threat conditions affect all of Bryan County. Critical facilities and vulnerable populations are located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. Alerting all residents of tornado conditions is a county-wide concern. Any mitigation steps taken related to tornado events should be undertaken on a countywide basis and include the Cities Pembroke and Richmond Hill.

E. Education & Awareness – The Bryan County Hazard Mitigation Plan Update Committee has identified several methods of public education and awareness regarding hazard mitigation. All public information efforts are aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan as well as other operating procedures. Many of the education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through the county website, newspaper articles and bulletins concerning updated county evacuation routes.

F. Completed & Deleted Action Steps – The plan update committee understood that most of the Tornado action steps were centered on strengthening structures as well as continuing planning and educating efforts and saw no reason to remove any action step.

G. Unchanged Action Steps – A large part of the changes in plan update guidance were in relation to these steps: the addition of responsible department, funding estimate and potential source, and time range to start and complete and were discussed in Plan Update meetings and amended at this time.

Natural Hazard F – WILDFIRE

A. Mitigation Goals – Wildfire can be devastating for humans, residential and business properties, crops, and animals. The overwhelming losses can, with proper planning, usually be lessened. The efforts of the Bryan County Hazard Mitigation Plan Update Committee have been focused on continuing the previous successful efforts to reduce the impact of drought conditions on wildfire threats. Additional mitigation efforts are focused on educating citizens on wildfire, its risks, and ways to protect lives and properties, to support fire rescue and suppression efforts, and developing and implementing effective community ordinances and codes.

B. Identification and Analysis of Range of Mitigation Options

The committee identified structural and non-structural mitigation measures to reduce the threat of a wildfire event. Non-structural measures may result in alterations to current land use policies and building codes, if necessary; to ensure that proper mitigation measures are undertaken. Non-structural measures include better training and equipment as well as public education efforts.

Community values are reflected in the proposed measures. Historic considerations are reflected in an action step to provide more protection for an important community asset at all areas within Bryan County. Some restrictions exist for the administrative section under the funding consideration; and Economic section for the costs of actions and outside funding will be required considerations. The Technical, Social, Political, Legal,

and Environmental considerations are favorable as many mitigation steps will have been identified in the recently updated Community Wildfire Protection Plan.

New buildings and infrastructure may be subject to urban interface requirements to reduce destruction of property by wildfire. Existing buildings and infrastructure will be included in recommendations to retrofit to comply with urban interface requirements.

C. Mitigation Strategy for Wildfire - All Action Steps involving Drought and Wildfire Hazards.

D. Multi-Jurisdictional Considerations – The County currently utilizes SMS Text Alerts to send the warning text messages to those who have elected to receive them. Wildfire threat conditions affect all of Bryan County. Critical facilities and vulnerable populations are located in the Cities Pembroke and Richmond Hill as well as in unincorporated areas of the county. Alerting all residents of wildfire conditions is a county-wide concern. Any mitigation steps taken related to wildfire events should be undertaken on a countywide basis and include the Cities of Pembroke and Richmond Hill.

E. Education & Awareness – The Bryan County Hazard Mitigation Planning Committee has identified several methods of public education and awareness regarding hazard mitigation. All public information efforts are also aimed at keeping the citizens of Bryan County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles, alerts on the county website, and bulletins concerning updated county evacuation routes.

F. Completed & Deleted Action Steps – The plan update committee understood that most of the Wildfire action steps were centered on isolating structures as well as continuing planning and educating efforts and saw no reason to remove any action step.

G. Unchanged Action Steps – A large part of the changes in plan update guidance were in relation to these steps: the addition of responsible department, funding estimate and potential source, and time range to start and complete, and were discussed in Plan Update meetings and added at this time.

With regard to notification systems, "Bryan County Emergency Management Agency (BEMA) uses CodeRED to send EMERGENCY notifications by phone, email, text, and social media to keep citizens informed of emergencies such as an evacuation notices, utility

outages, water main breaks, fire or floods, chemical spills, or other emergency situations." Action steps to have improved or additional systems as they become available remain.

CHAPTER 4 – EXECUTING THE PLAN

Section I **Action Plan Implementation**

Section II **Evaluation**

Section III **Multi-Jurisdictional Strategy and Considerations**

Section IV **Plan Update and Maintenance**

Overview of updates to Chapter 6: Executing the plan	
Chapter 1 Section	**Updates to Section**
I. Implementation Action Plan	• County Commissioners and City Councils along with the EMA Director's new review schedule
II. Evaluation, Monitoring, Updating Note whether the original method and schedule worked	• Will continue same actions as per GEMA & FEMA requirements adding a review after major events
III. Plan update and maintenance	• Revisit this plan for review after any major Presidentially Declared Disaster, every time another relevant plan is changed or added, or every 5 years at the latest is to be kept in place

Updated material: Utilizing STAPLEE criteria from Worksheets #4, the mitigation action steps were re-evaluated for their inclusion into this 5-year plan update, prioritized as necessary to the present situations and conditions, and further data for each step was included as per the revised requirements.

All County, unincorporated area, both city representatives, and the county's assigned GEMA planner were encouraged to participate in the review process and attended the

update meetings to facilitate their input into each goal and action step, as well as providing information with regard to hazards experienced since the inception of the original plan. The draft plan was published on the County Website for review and comment during the update process. Also utilized were e-mail communications for this process.

SECTION I – Action Plan Implementation

Administrative Actions

The hazard mitigation plan update process was overseen by the Bryan County Emergency Management Agency. The Bryan County Board of Commissioners has authorized the submission of this plan update to both GEMA and FEMA for their respective approvals. Upon favorable responses from each of these agencies, the Bryan County Commissioners, and the Mayors of Pembroke and Richmond Hill will act to formally adopt this plan.

Authority and Responsibility

After formal adoption of the Bryan County Hazard Mitigation Plan Update, the County Commissioners and City Mayors will keep in consideration the priority tasks and oversee the implementation of said tasks using branches of city and county government where appropriate.

As determined by the planning process, the original Bryan County Hazard Mitigation Plan Committee had developed a method to ensure that regular review and update of the Plan occurs. The Emergency Management Agency Director will assemble, in every fifth year, a Hazard Mitigation Plan Review Committee. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. The committee will review each goal and objective to determine relevance to changing situations in the County, as well as changes in state and federal policy and to ensure that goals are addressing current and expected conditions. The committee will also review the risk assessment portion of the Plan to determine if this information should be modified. Members of this 2014 review see no reason to alter this schedule.

The parties responsible for the various implementation actions, as assigned by the County Commission and City Councils, will continue to provide a project status report and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised.

County Commissioners and City Council members will evaluate and update the plan to ensure mitigation action steps are being established and that existing programs are utilizing the guidance provided by the Hazard Mitigation Plan. The EMA Director will then forward any changes to GEMA's Hazard Mitigation Planner for consideration.

Prioritization

Members of the Bryan County Hazard Mitigation Plan Update Committee prioritized the identified mitigation actions based on what would be perceived as most beneficial to the community. A list of mitigation goals and related action items was compiled from the input of the plan update committee, as well as from others within the community. Several criteria were established to assist committee members in the prioritization of these suggested mitigation actions. Criteria included perceived cost benefit or cost effectiveness, availability of potential funding sources, overall feasibility, measurable milestones, multiple goals, and both public and political support for the proposed actions. Through this prioritization process, several projects emerged as being of greater priority than others. Some of the projects involved spending considerable amounts of funds to initiate the required actions. The determination of the cost benefit analysis (such as the FEMA B/CA model) of a project will be implemented at the time of application or funding request. Other projects allowed the community to pursue completion using potential grant funding while others required no significant financial commitment by the community, but could be performed with staff already employed.

Incorporation of Local Hazard Mitigation Plan into Other Plans

The County Commission and City Councils will review recommendations of the committee in every plan review year. County Commissioners and City Council members will evaluate and update the Plan to ensure mitigation action steps are being implemented and that existing programs are utilizing the risk assessment and mitigation strategy as applicable provided by the Hazard Mitigation Plan Update in updates to their Comprehensive Plan and Local Emergency Operations Plan. The EMA Director will then forward any changes to GEMA's Hazard Mitigation Planning Specialist.

Community Resiliency

Estimation of potential damages and costs in the event of a natural hazard achieves two ends: it enables the identification of critical economic targets for hazard mitigation measures, as well as to enhance the ability to prioritize post-disaster response in aiding the community to recover in the most cost-effective and citizen supportive methodology.

SECTION II – Evaluation

The Emergency Management Agency Director will assemble a Committee to ensure that this plan is monitored and updated at least every fifth year or more often if deemed necessary. The method of evaluation will consist of utilizing a checklist to determine what mitigation actions were undertaken, the completion date of these actions, the cost associated with each completed action, and whether actions were deemed to be successful.

A schedule of regular meetings and continual communications will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan.

The EMA Director will ensure the results of the evaluation(s) are reported to the Bryan County Board of Commissioners, the Mayors of the cities of Pembroke and Richmond Hill as well as to any agencies, stakeholders, or organizations having an interest in the hazard mitigation activities identified in the plan.

SECTION III – Multi-Jurisdictional Strategy and Considerations

The Emergency Management Agency is the overall implementing agency for projects such as Hazard Mitigation. Bryan County and the cities of Pembroke and Richmond Hill have authorized the EMA to act, in a prudent manner, in their behalf.

The cities of Pembroke and Richmond Hill and the unincorporated county were included in the plan update process. Participation from each jurisdiction was solicited and received by the Bryan County Emergency Management Agency. As a result, a truly multi-jurisdictional plan update was created for Bryan County with constructive ideas and viewpoints from participants included.

SECTION IV – Plan Update and Maintenance

Per the requirements set forth in the Disaster Mitigation Act of 2000, Bryan County is required to update and revise the plan every five years. The desire of the Bryan County Hazard Mitigation Plan Update Committee is in agreement to review and revise the plan every five years, and any time another county plan effort would benefit from data contained within. At the discretion of the EMA Director, another Bryan County Hazard Mitigation Plan Review/Update Committee will convene in order to accomplish this review.

The revision process should include a firm schedule of milestones and timeline, and identify any agencies or organizations participating in the plan revision. The Committee will review the mitigation goals and action items to determine their relevance to dynamic situations in the county, as well as changes in State or Federal policy, and to ensure that

they are addressing current and expected conditions. The Committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data, and utilizing cost/benefit criteria.

Bryan County is dedicated to involving the public directly in reviews and updates of the Hazard Mitigation Plan. During the plan revision process, the Committee shall conduct, at a minimum, one public kick-off meeting as well as a hearing near the completion of the revision process. These public hearings will provide the public a forum for which they can express their concerns, opinions, or ideas about the plan. Additionally, if persons from the community express interest in participation in the planning process, they will be provided the opportunity to suggest mitigation measures for the community, or give reason for objections or doubts as to an action step's feasibility.

Documentation will be maintained to indicate all efforts at continued public involvement. This documentation will include newspaper clippings reflecting the advertised public hearing notice, sign-in sheets, meeting minutes, etc., and will be added to Appendix E. All relevant information will be forwarded to the Georgia Emergency Management Agency and the Federal Emergency Management Agency as a product of the proposed plan revision.

The EMA Director will ensure the revised plan is presented to the Bryan County Board of Commissioners for formal adoption. In addition, all holders of the county plan will be notified of changes affecting their jurisdictions.

No later than the conclusion of the five-year period following initial approval of the plan, the EMA Director shall submit an updated Hazard Mitigation Plan to the Georgia Emergency Management Agency and the Federal Emergency Management Agency for their review and approval.