TOWN COUNCIL

STAFF REPORT
Bluffton Police Department

MEETING DATE:	September 13, 2016
PROJECT:	Resolution to the Beaufort County Mutli-jurisdictional Hazard Mitigation Plan
STAFF LEAD:	Lt. Christian Gonzales, Emergency Management Manager

RECOMMENDATION: It is recommended Town Council adopts this resolution as it is required by the Federal Emergency Management Agency.

BACKGROUND: The Disaster Mitigation Act of 2000 states a Hazard Mitigation Plan is required by the Federal Emergency Management Agency for all counties and municipalities in the country. Its purpose is the effort to reduce loss of life and property by lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters, and develop long-term strategies for protecting people and property from future hazard events.

ANALYSIS: The resolution to adopt the Beaufort County Multi-jurisdicational Hazard Mitigation Plan explains the purpose and necessity of the plan.

ATTACHMENTS:

1. Hazard Mitigation Plan Resolution – Beaufort County
2. Hazard Mitigation Plan Resolution – Beaufort County Municipalities
3. Beaufort County Mutli-jurisdicational Hazard Mitigation Plan

2016 / 13

RESOLUTION OF BEAUFORT COUNTY COUNCIL ADOPTING THE HAZARD MITIGATION PLAN

WHEREAS, the Council of Beaufort County, South Carolina recognizes that the Natural Hazard Mitigation Plan is an assessment of the risks natural hazards present to communities and how losses to human life and to property can be minimized through advance preparation; and

WHEREAS, under the Disaster Mitigation Act of 2000, a Hazard Mitigation Plan is required by the Federal Emergency Management Agency (FEMA) for all counties and municipalities in the country; and

WHEREAS, the Hazard Mitigation Plan proposed by Beaufort County is in compliance with the federal hazard mitigation planning requirements contained in 44 CFR 201.6(b)-(d) and State Emergency Management has reviewed and determined that Beaufort County's Hazard Mitigation Plan meets federal requirements; and

WHEREAS, projects and actions that are identified in the plan are eligible for FEMA pre-disaster mitigation funding; and

WHEREAS, State Emergency Management requests formal endorsement of the plan by Beaufort County Council prior to issuance of formal approval; and

WHEREAS, Beaufort County has been an official participant in the planning process of the Beaufort County Hazard Mitigation Plan that the Lowcountry Council of Governments prepared for Beaufort County; and

WHEREAS, the Lowcountry Council of Government has prepared and recommends to the Beaufort County Council, the governing body of the County of Beaufort, a Hazard Mitigation Plan attached hereto and incorporated by reference herein as if set forth verbatim which is intended to protect the public health and general welfare of the citizens of Beaufort County.

NOW, THEREFORE, BE IT RESOLVED, by the Beaufort County Council that the Beaufort County Hazard Mitigation Plan is hereby endorsed and adopted.

The resolution shall become effective this 27th day of June 2016.

COUNTY COUNCIL OF BEAUFORT COUNTY

By: _____
D. Paul Sommerville, Chairman

APPROVED AS TO FORM:

_____
Thomas J. Keaveny, II County Attorney

ATTEST:

_____
Suzanne M. Rainey, Clerk to Council

Whereas, the Council of the *Town of Bluffton* South Carolina recognizes that the Natural Hazard Mitigation Plan is an assessment of the risks natural hazards present to communities and how losses to human life and to property can be minimized through advance preparation. This plan is required by the Federal Emergency Management Agency (FEMA) for all counties and municipalities in the country. Projects and actions that are identified in the plan are eligible for FEMA pre-disaster mitigation funding.

Whereas, the *Town of Bluffton* has been an "official participant" in the planning process of the Natural Hazard Mitigation Plan that the Lowcountry Council of Governments prepared for Beaufort County.

Now, therefore, be it resolved, by the Council of the *Town of Bluffton*, South Carolina to endorse the Natural Hazard Mitigation Plan.

The resolution shall become effective this _____ day of September, 2016.

BEAUFORT COUNTY HAZARD MITIGATION PLAN 2015 UPDATE

Unincorporated Beaufort County
The City of Beaufort
The Town of Bluffton
The Town of Hilton Head Island
The Town of Port Royal

Prepared By

Lowcountry
COUNCIL OF GOVERNMENTS

TABLE OF CONTENTS

1. Introduction 1-1
Background 1-1
Planning Process 1-5
Getting Organized 1-5
Hazard Mitigation Steering Committee 1-5
Convening the Hazard Mitigation Steering Committee 1-5
Stakeholder Engagement 1-6
Other Agencies 1-8
Assess Hazards and Vulnerabilities 1-8
Analyze Capabilities 1-8
Update the Mitigation Plan 1-9
Evaluate Your Work 1-9
A Regional Approach 1-9
Public Involvement 1-10
Federal Funding Sources for Mitigation 1-11
2. Hazard Identification and Profiles 2-1
Introduction 2-1
Hurricanes, Tropical Storms 2-1
Past Occurrences of Hurricanes 2-3
September 1804 2-6
August 1854 2-6
August 1893 2-6
October 1902 2-6
August 1940 2-6
October 1944 2-7
Hurricane Cindy – July 1959 2-7
Hurricane Gracie - September 1959 2-7
Hurricane Donna – September 1960 2-8
Hurricane David – September 1979 2-8
Hurricane Bob – July 1985 2-8
Hurricane Hugo – September 1989 2-8
Hurricane Bertha – July 1996 2-8
Hurricane Floyd – September 1999 2-9
Past Occurrences of Tropical Storms 2-9
Future Probabilities of Hurricanes 2-9
Past Occurrences of Nor'Easters 2-10
Flooding 2-11
Past Occurrences of Flooding 2-15
Future Probabilities of Flooding 2-16
Extreme Precipitation 2-16
Storm Surge 2-17
Sea Level Rise and King Tides 2-20
Erosion 2-28
Past Occurrences and Future Probabilities of Erosion 2-28
Winter Storms 2-31
Past Occurrences of Winter Storms 2-31
Future Probabilities of Winter Storms 2-32

Drought 2-32
Extreme Heat 2-33
Wind: Thunderstorms, Hail, and Tornadoes 2-34
Past Occurrences of Thunderstorms 2-35
Future Probability of Thunderstorms 2-35
Hail 2-35
Tornadoes 2-35
Past Occurrences of Tornadoes 2-36
Future Probabilities of Tornadoes 2-39
Earthquakes 2-39
Past Occurrences of Earthquakes 2-40
Earthquakes near Beaufort County: potentially a major impact. 2-40
1886 Earthquake 2-41
Future Probabilities of Earthquakes 2-41
Fire 2-43
Past Occurrences of Fire 2-43
Future Probabilities of Fire 2-45
Hazards not Historically Prevalent 2-46
Dam Failure 2-46
Landslides 2-46
Tsunamis 2-46
Volcanic Hazards 2-47
3. Vulnerability Assessment 3-1
Vulnerability Summary 3-1
Social Vulnerability 3-2
Inventory Information 3-5
Flooding 3-6
Floodplain 3-6
Flood Depths 3-6
City of Beaufort 3-6
Town of Bluffton 3-6
Town of Hilton Head 3-6
Town of Port Royal 3-7
Unincorporated County – Bluffton Township 3-7
Unincorporated County – Daufuskie 3-7
Unincorporated County – Fripp Island 3-7
Unincorporated County – St. Helena 3-7
Unincorporated County – Sheldon-Dale 3-8
Flood Prone Structure Counts 3-8
Critical Facilities 3-11
Repetitive Loss Areas 3-14
Unincorporated County 3-14
Beaufort 3-15
Bluffton 3-15
Hilton Head 3-15
Port Royal 3-17
Access 3-17
Conclusions 3-19
Erosion 3-19

Development Trends 3-20
Beaufort County 3-21
City of Beaufort 3-21
Town of Bluffton 3-22
Town of Hilton Head Island 3-22
Town of Port Royal 3-22
Summary 3-22
Hazus Analysis 3-23
Overview 3-23
Building Inventory 3-23
2015 HAZUS Information 3-24
Wind 3-24
Combined Wind and Flood Damage 3-27
Earthquake 3-34
4. Community Mitigation Capability Assessment 4-1
Beaufort County: 4-3
Northern Beaufort County Plan, 2007 4-3
Southern Beaufort County Plan, 2007: 4-3
Comprehensive Plan, 2015-16: 4-4
Comprehensive Plan, 2010: 4-4
Daufuskie Island Plan 2010 4-5
Beaufort County Community Development Code 12/2014 4-6
Stormwater BMP Manual, 3/2012 4-6
Stormwater Master Plan 2006 4-7
Beaufort County Regional Stormwater Quality BMP Retrofit Project 2011 4-7
Beaufort County Disaster Recovery Plan 2011 4-8
Emergency Operations Plan 4-8
Other 4-9
City of Beaufort: 4-9
Comprehensive Plan, 2009 revision 4-9
Unified Development Ordinance, 2006 4-11
Historic Preservation Plan Update 7/2008 4-12
Town of Bluffton 4-13
Comprehensive Plan, 2007: 4-13
Comprehensive Plan 5-year Audit 5/2014 4-14
Stormwater BMP Manual, 2011. 4-14
May River Watershed Action Plan 2011 4-15
Unified Development Ordinance 4-16
Town of Hilton Head Island: 4-17
Comprehensive Plan, 2010 4-17
Local Beach Management Plan 11/2008 4-18
Land Management Ordinance 10/2014 4-19
Beaufort County Hazard Mitigation Plan 4-20
Island Wide Drainage Study, August 30, 1995 4-21
Floodplain Management and Land Management Ordinance 4-22
Town of Port Royal: 4-22
Comprehensive Plan 2009 4-22

2014 Comprehensive Plan Update 4-24
Building Regulations 4-24
Town Code 4-25
The Local Government Capability Matrix 4-26
State Plans and Regulations 4-29
South Carolina Hazard Mitigation Plan 4-29
South Carolina Hurricane Plan 4-29
Federal Regulations 4-32
5. Mitigation Goals and Objectives 5-1
Introduction 5-1
Goals and Objectives for the Mitigation Plan 5-1
6. Mitigation Action Plan (and update of previous actions) 6-1
Explanation of Tables 6-1
National Floodplain Insurance Program—prioritization and participation 6-2
Addressing Known Risks and Vulnerabilities 6-2
Benefit-to-Cost Review 6-4
Cost Benefit Review—Prioritization of Mitigation Actions 6-4
2009 Actions Status Update 6-5
Beaufort County 2009 Actions and Status 6-6
City of Beaufort 2009 Actions and Status 6-11
Town of Bluffton 2009 Actions and Status 6-15
Town of Hilton Head Island 2009 Actions and Status 6-19
Town of Port Royal 2009 Actions and Status 6-23
New and Ongoing Actions 2015 6-16
New and Ongoing Actions 2015 Beaufort County 6-17
New and Ongoing Actions 2015, City of Beaufort 6-23
New and Ongoing Actions 2015, Town of Bluffton 6-28
New and Ongoing Actions 2015, Town of Hilton Head Island 6-32
New and Ongoing Actions 2015, Town of Port Royal 6-35
Actions Incorporated into the Mitigation Plan and Implementation 6-40
Implementation through Existing Plans and Programs 6-40
Continued Public Involvement 6-41
The Next Planning Cycles 6-41
Idealized Schedule of Implementation 6-42
Monitoring, Evaluating, and Updating the Plan 6-42
Plan Maintenance 6-42
Updating the Plan 6-42
7. References (includes original plans references and any updates) 7-1

Appendix A – Meeting Agendas and Notes
Appendix B – Hazard Mitigation Planning Committee Meeting Sign-In Sheet(s)
Appendix C—SoVI Variables and Explanation
Appendix D – Survey Results and Analysis

List of Figures

Figure 1-1: Beaufort County Locator Map 1-1
Figure 1-2: Beaufort County and Incorporated Areas 1-4
Figure 2-1: Hurricanes Beaufort and Surrounding Counties, 1850-2015 2-3
Figure 2-2: All Tropical Storms Including Hurricanes, 1850-2015 2-5
Figure 2-3. Beaufort County Waterways 2-13
Figure 2-4: Beaufort County Flood Zones 2-14
Figure 2-5: Average Monthly High Precipitation by Year 1932-2002 (Millimeters) 2-17
Figure 2-6: Southern Beaufort County Storm Surge Map 2-18
Figure 2-7: Northern Beaufort County Storm Surge Map 2-19
Figure 2-8: Historic Sea Levels at Fort Pulaski, Georgia 2-20
Figure 2-9: Tidal Flood Events at Fort Pulaski. Georgia 2-21
Figure 2-10: Projected Sea Level Rise Scenarios 2-22
Figure 2-11: Coastal Inundation per One Ft. of Sea Level Rise, Southern Beaufort County 2-24
Figure 2-12: Affected Structures per One Ft. of Sea Level Rise, Southern Beaufort County 2-25
Figure 2-13: Coastal Inundation per One Ft. of Sea Level Rise, Northern Beaufort County 2-26
Figure 2-14: Structures Affected per One Ft. of Sea Level Rise, Northern Beaufort County 2-27
Figure 2-15: Rates of Erosion and Accretion in Beaufort County 2-30
Figure 2-16: Average High Temperature for July in South Carolina 2-34
Figure 2-18: Tornado Events in or near Beaufort County, 1950-2014 2-38
Figure 2-19: Historical Epicenter Locations 1698-2015 2-42
Figure 2-20: Beaufort County Wildfires 1998-2010 2-44
Figure 2-21: Occurrences of Landfires in Beaufort County, 1946-2015 2-45
Figure 3-1: Social Vulnerability 3-4
Figure 3-2: Beaufort County Planning Districts 3-9
Figure 3-3: Repetitive Loss Areas on Hilton Head Island 3-16
Figure 3-4: Major Routes in the Floodplain in Beaufort County 3-18
Figure 3-5: Single Family Housing Starts 2000-2014 for Incorporated Beaufort County 3-21
Figure 3-6: Hurricane Damage Patterns 3-27
Figure 3-7: Projected Storm Surge from Hugo Model Category 3 Storm 3-28
Figure 3-8: Economic Losses (Building/Contents) from Hugo Model Category 3 Storm 3-29
Figure 3-9: Damage Percentage of Total Value in Wood Construction 3-32
Figure 3-10: Damage Percentage of Total Value of Manufactured Housing 3-33

Figure 3-11: Total Structural Losses from 6.9 Charleston Earthquake by Census Tract....3-35
Figure 3-12: Damage to Manufactured Housing from 6.9 Magnitude Charleston Earthquake 3-36
Figure 3-13: Damage to Wood Construction from 6.9 Magnitude Charleston Earthquake 3-37

List of Tables

Table 1-1: Population Growth in Beaufort County and Municipalities 1-2
Table 1-2: Housing Growth 2000-2013....1-3
Table 1-3: Hazard Mitigation Planning Stakeholders 1-7
Table 2-1: Saffir-Sampson Scale and Typical Damages....2-2
Table 2-2. Storm Tracks Passing Through Beaufort County 1850-2015....2-4
Table 2-3. Storm Tracks Passing within 50 miles of Beaufort County 1850-2015 ..2-4
Table 2-4: Estimated Recurrence Intervals of Hurricanes and Tropical Storms within 50 miles of Beaufort County Since 1850....2-10
Table 2-5: SC Sea Grant Flood Scenarios....2-21
Table 2-6: Number of Structures Affected in Beaufort County per One Ft. of Sea Level Rise 2-23
Table 2-7: Erosion and Beach Nourishment in Beaufort County....2-29
Table 2-8: Time Spent in Drought Conditions 1925-2015 2-33
Table 2-9: Enhanced Fujita Tornado Scale....2-36
Table 2-10. History of Known Tornadoes in Beaufort County, 1950 – 2014 2-37
Table 2-11. Estimated Recurrence Intervals of Tornadoes (based on data from 1950 to 2015)....2-39
Table 2-12. Richter Scale Magnitude Classes 2-40
Table 2-13. Estimated Recurrence Intervals of Earthquakes in Beaufort, Berkeley, Colleton, Charleston and Dorchester Counties....2-41
Table 2-14: Overall Hazard Probability 2-48
Table 3-1: Assessment Valuation Data....3-1
Table 3-2: Loss Information per Hazard in Beaufort County 1960-2014....3-2
Table 3-3: 29 Variables Utilized in SoVI Analysis 3-3
Table 3-4: Critical Facilities....3-5
Table 3-5: Number of Structures in Flood Areas....3-8
Table 3-6: Structures in Flood Zones in Unincorporated Beaufort County by Planning District....3-10
Table 3-7: Flood Insurance Policies 2015....3-10
Table 3-8: Structures in Storm Surge Zones in Beaufort County by Planning District 2015....3-11

Table 3-9: Critical Facilities Located in the 100-Year Floodplain in Incorporated Communities 3-11
Table 3-10: Critical Facilities Located in the 100-Year Floodplain of the Unincorporated County 3-13
Table 3-11: Increases in Vehicle Ownership 3-19
Table 3-12: Population Increase 2000-2014 3-20
Table 3-13: Building Permits County-Wide 2010-2014 3-20
Table 3-14: Distribution of Structures by General Construction Type Hazus 2015 3-23
Table 3-15: Replacement Values by General Construction Type Hazus 2015 3-23
Table 3-16: Estimated Economic Losses by Wind Event 3-25
Table 3-17: Estimated County-Wide Building Damage by Wind Event (Building Count) 3-26
Table 3-18: Estimated Tons of Debris Generated by Storm Category 3-26
Table 3-19: Economic Losses from Category 3 Wind and Flood Scenario 3-31
Table 3-20: Dollars in Structural Damage 3-34
Table 4-1. Beaufort County Documents used for Capability Assessment 4-2
Table 4-2. Capability Matrix 4-27
Table 4-3. Regional Hurricane Shelters in Adjacent Counties 4-30
Table 4-4: Lowcountry Special Needs Shelters 4-31
Table 6-1: Prioritization Scoring Table 6-3
Table 6-2: 2009 Actions and Status, Beaufort County 6-6
Table 6-3: 2009 Actions and Status, City of Beaufort 6-11
Table 6-4: 2009 Actions and Status, Town of Bluffton 6-15
Table 6-5: 2009 Actions and Status, Town of Hilton Head Island 6-19
Table 6-6: 2009 Actions and Status, Town of Port Royal 6-23
Table 6-7: 2015 Actions Beaufort County 6-17
Table 6-8: 2015 Actions City of Beaufort 6-23
Table 6-9: 2015 Actions Town of Bluffton 6-28
Table 6-10: 2015 Actions Town of Hilton Head Island 6-32
Table 6-11: 2015 Actions Town of Port Royal 6-35

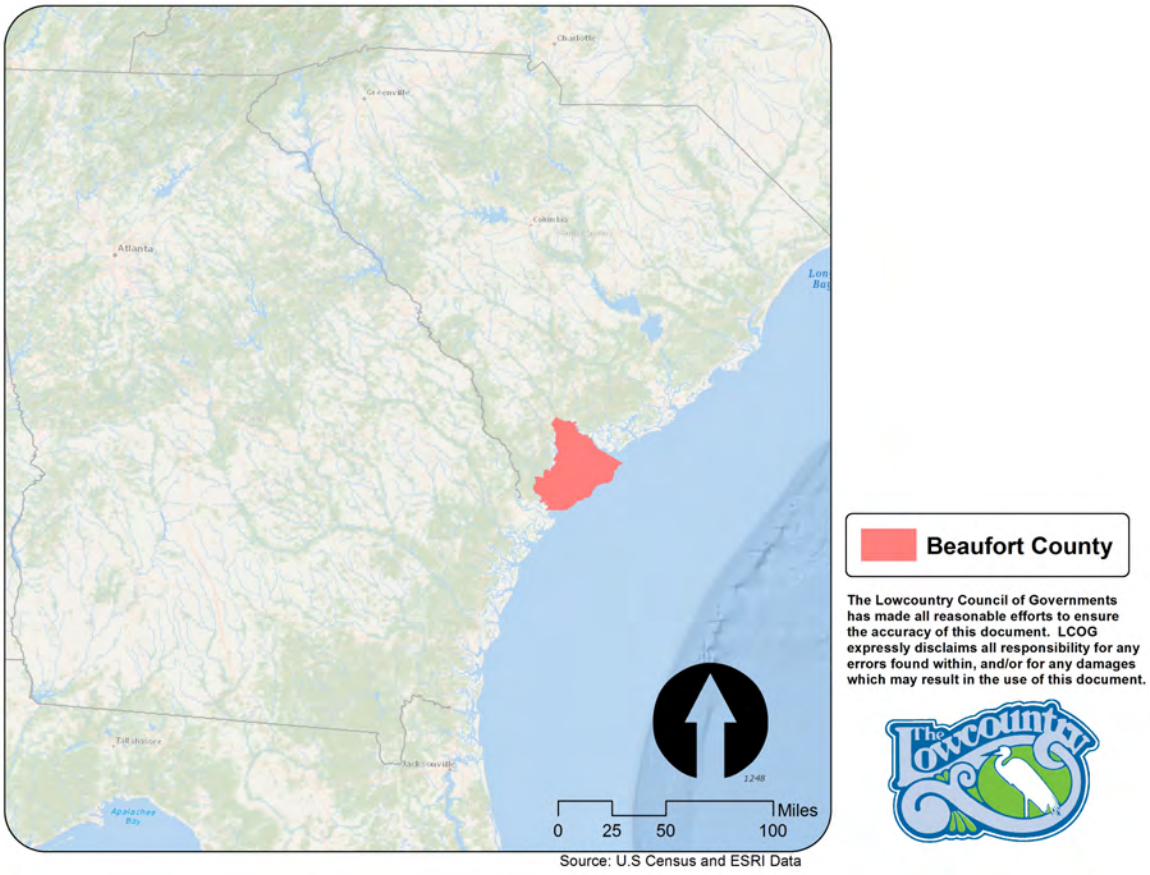
1. Introduction

Beaufort County, South Carolina and its incorporated communities prepared this update to their Hazard Mitigation Plan to assess the communities' vulnerabilities to natural hazards and prepare a long-term strategy to address these hazards and prevent future damage and loss of life. This plan was created through a consensus-driven process engaging County and municipality officials, residents, and business owners.

Background

Beaufort County is situated along the southern portion of South Carolina's Atlantic coastline (as shown in Figure 1-1) and has an area of 587 square miles. It lies in the coastal plain and is comprised largely of tidal marshes and swamp areas; the county has little relief with a high elevation of approximately 50 ft. National Geodetic Vertical Datum 1929 (NGVD 29). Beaufort County's climate is generally subtropical with hot summers and mild winters. The average annual rainfall is approximately 49 inches with most precipitation occurring from April to October.

Figure 1-1: Beaufort County Locator Map



Beaufort County is one of the state's fastest growing counties (by population percentage increase) with a 2000 population of 120,937 (U.S. Census) which represented a 40% increase from the 1990 population. By 2014 the County population had risen to 175,852, an increase of 45% from 2000.

Table 1-1: Population Growth in Beaufort County and Municipalities

	Census 2000	Census 2010	2014 Estimates	Percent Change 2000-2010	Percent Change 2010-2014
Beaufort County	**120,937**	**162,233**	**175,852**	**34.15%**	**8.39%**
Unincorporated	120,937	162,233	175,852	34.15%	8.39%
Beaufort city	12,950	12,361	13,130	-4.55%	6.22%
Bluffton town	1,275	12,978	15,199	882.75%	17.11%
Hilton Head Island town	33,862	37,099	40,039	9.56%	7.92%
Port Royal town	3,950	10,678	11,870	170.33%	11.16%

Major population growth is usually accompanied by, or may be partially caused by, increased residential development. . Table 1-2 illustrates the increasing in housing units in the county from 2000-2013. According to the most recent data, housing growth has slowed considerably from booming pre-recession levels, and the giant leap made between 2009 and 2010.

Table 1-2: Housing Growth 2000-2013

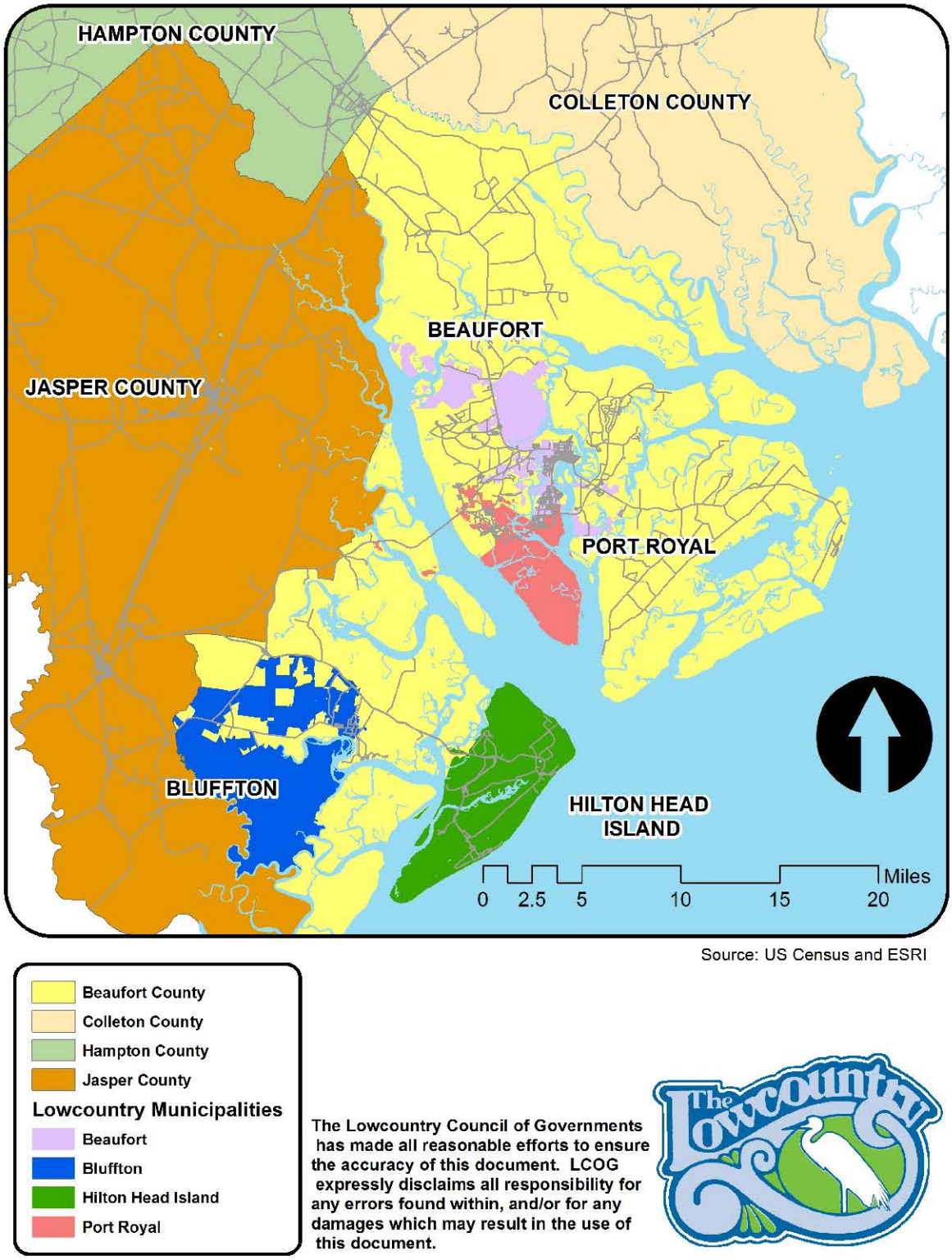
Year	Housing Units
2000	60,509
2001	63,951
2002	65,971
2003	68,474
2004	71,082
2005	73,809
2006	78,198
2007	81,383
2008	83,362
2009	84,530
2010	93,023
2011	93,272
2012	93,178
2013	92,872
Percent Change 2000-2013	53.5%

Source: US Census and ACS

There are five incorporated municipalities within the county: the Town of Bluffton, the City of Beaufort, the Town of Hilton Head, the Town of Port Royal, and a portion of the Town of Yemassee. The majority of Yemassee lies within Hampton County to the northwest of Beaufort County, and therefore they chose to participate in Hampton County's Hazard Mitigation Plan Process, which is also currently underway. The City of Beaufort is the County Seat. A map of the county showing the locations of the incorporated communities is provided as Figure 1-2.

Beaufort County's coastal location makes it susceptible to flooding, erosion, and wind hazards associated with hurricanes, tropical storms and nor'easters. Furthermore, its proximity to the Charleston area, one of the most seismically active areas along the East Coast, makes it vulnerable to seismic hazards. The county's susceptibility to these and several other natural hazards were considered as part of this plan.

Figure 1-2: Beaufort County and Incorporated Areas



Planning Process

Getting Organized

Since the 2009 update, the formerly separate Beaufort County Emergency Management Department was reorganized and transferred to the Sherriff's Department, while recovery and mitigation planning is overseen by the Environmental Engineering Department.

The update of this plan was coordinated by the Planning Department of the Lowcountry Council of Governments, under contract to Beaufort County. Each jurisdiction in the County reviewed all of the technical information in the plan, and provided pertinent GIS, valuation and other data as necessary for updates. Accordingly, existing planning documents, a number of which were themselves significantly updated since 2010, were re-evaluated to examine which documents support mitigation, and where additional mitigation measures may need to be incorporated into existing plans.

Hazard Mitigation Steering Committee

As a key part of the process of doing the second update of the Plan, a steering committee was formed; it consisted of officials from all four counties in the Region, as well as individual municipalities in Beaufort County. The membership of this committee was based on the members who participated in the original hazard mitigation plan. Participation by communities in the Committee was defined as attendance (at least once) of at least one representative from each jurisdiction and/or agency and one-on-one meetings with LCOG staff to both gather information and also to review suggested changes to such key components of the Plan such as Mitigation Capability Assessments and Action Plan items, thereby incorporating the review process. Through these meetings, this Hazard Mitigation Steering Committee developed a countywide Hazard Mitigation Plan.

Committee members and their jurisdictions have a history of working together before, during and after natural disasters and expect to continue doing so well after the completion of this update. LCOG staff are also committed to working with the Committee to ensure that actions recommended in this update are implemented.

Convening the Hazard Mitigation Steering Committee

Officials from Beaufort, Colleton, Hampton, and Jasper met at LCOG on two occasions to guide the planning process. Bringing the four counties together into one HMP committee provided the opportunity to highlight issues of regional concern, and develop strategies emphasizing coordination between the counties. The following list contains the names and roles of the officials from the four counties who participated in the Steering Committee.

Beaufort County Staff
John Webber- Disaster Recovery Coordinator
Eric Larson-Director of Environmental Engineering
Chuck Atkinson- Director of Building Codes
Colleton County Staff
Sirena Memminger- Emergency Management
Suzanne Gant-Emergency Manager
Hampton County Staff
Greg Cook- Fire Chief
Chris Altman- Director of Emergency Services
Blake Hodges- Director of Public Works
Susanne D. Peeples-Director of Emergency Management
Jasper County Staff
Wilbur A. Daley- Director of Emergency Services
Russell Wells-Deputy Director of Emergency Services
Town of Hilton Head
Marcy Benson-Senior Grants Administrator
South Carolina Emergency Management Department
Andrew Phillips-Hazard Mitigation Specialist
Katie Norris- State Hazard Mitigation Officer
Charlotte Foster-Hazard Mitigation Specialist
LCOG Staff
Ginnie Kozak-Planning Director
Jonathan Sherwood-Community and Regional Planner
Lawrence Holdsworth-Regional Planner

On **February 5, 2015** the first meeting of the Steering Committee meeting was held. At this meeting the goals and objectives of the previous HMP were reviewed and significantly revised to incorporate the evolving landscape of Hazard Mitigation, and emerging needs of the jurisdictions.
A second meeting of the Steering Committee was convened on **September 25th**, where mitigation actions were distributed to the HMSC for their review. The HMSC was directly involved in deciding what actions were needed in order to further hazard mitigation within the County. A review of the identified hazards was conducted in order to make sure no possible mitigation action was omitted from the plan. Finally, the staff was informed about the requirements of the updates, and a review of all sections of the plan was performed.

Stakeholder Engagement

On recommendation of the HMSC, LCOG coordinated with key personnel in the county and municipalities to determine which departments, agencies, staff, should be included in HMP dialogue and could be resources for data and perspectives on specific mitigation actions. The stakeholders reviewed the county's vulnerabilities to natural hazards, the status of previously recommended mitigation actions and considered a wide variety of ways to reduce and prevent potential damage from these hazards. These stakeholders, in coordination with representatives on the HMSC, helped select the most appropriate and feasible mitigation measures.

Table 1-3 is list of the stakeholders, not all-inclusive, that were made throughout the process whether by phone, email, or in-person meetings.

Table 1-3: Hazard Mitigation Planning Stakeholders

Jurisdiction/Agency	Role
Beaufort County	
Eric Larson	Dir. Environmental Engineering
Mark Rosenau	Dir. Public Works
Rob Merchant	Long Range Planner
Hakim Bayyoud	Floodplain Manager
David Zeoli	Emergency Manager
Neil Baxley	Dir. Emergency Mgmt
Rob McFee	Dir. Engineering and Infrastructure
Monica Spells	Assistant County Administrator
Dan Morgan	Director Mapping and Geographical Services
Colin Kinton	Transportation Engineer
Beaufort-Jasper Water and Sewer Authority	
Chris Petry	Chief Operating Officer
Ken Jordan	Director of Planning, Safety, and Security
Brian Chemsak	Director of Engineering
Beaufort Soil and Water Conservation District	
Shelby Berry	District Manager
Denise Parsick	Secretary/Treasurer
Bluffton	
Christian Gonzales	Dir. Emergency Mgmt
Kendra Lelie	Dir. Growth Management
Bluffton Township Fire District	
John Thompson	Chief
City Of Beaufort	
Libby Anderson	Planning Director
Robert Carson	Emergency Manager
Hilton Head	
Marcy Benson	Senior Grants Administrator
Tom Dunn	Emergency Mgmt. Coordinator
Nicole Dixon	Planner/CRS Coordinator
Shawn Colin	Deputy Director of Community Development
Bryan McIlwee	Stormwater Manager/Engineer
Scott Liggett	Dir. Public Projects and Facilities
Lady's Island-St. Helena Fire District	
Bruce Kline	Chief
Beaufort Jasper Natural Resources Conservation Service (USDA)	
Diane Leone	Supervisory District Conservationist
Sheldon Fire District	
Buddy Jones	Chief
Port Royal	
Linda Bridges	Planning Director
Alan Beach	Police Chief

Other Agencies

During the planning process, contacts were made with the following agencies to determine how their programs affect or could support Beaufort County's hazard mitigation efforts:

- Federal Emergency Management Agency (FEMA), Region IV
- Natural Resources Conservation Service (USDA)
- Beaufort County Soil and Water Conservation District
- South Carolina Department of Natural Resources (SCDNR)
- South Carolina Emergency Management Division (SCEMD)
- University of South Carolina. Hazard Research Lab (SCHRL)
- US Army Corps of Engineers

Each of the agencies will receive a draft of the plan for their review and comment.

Assess Hazards and Vulnerabilities

A significant task for LCOG staff, supported by considerable stakeholder input, was to perform a hazard identification, vulnerability assessment and risk assessment for Beaufort County. This process allowed the committee to analyze the county's greatest hazard threats and to determine its most significant vulnerabilities. Information was collected from the Beaufort County Building Code Department, Planning Department, GIS Department, and Emergency Management Department. Several state agencies were contacted including the South Carolina Emergency Management Division, the Department of Natural Resources, and The University of South Carolina Hazards Research Lab. Information was collected from agencies such as The Department of Health and Environmental Control Office of Ocean and Coastal Resource Management, the Forestry Commission, and the Geological Survey.

Analyze Capabilities

In coordination with the HMSC members and key stakeholders throughout Beaufort County and the municipalities, essential policy, planning, and regulatory documents were identified and reviewed. These included comprehensive plans, zoning ordinances, building codes, stormwater BMP's, disaster response plans, beach management plans, and a variety of other related literature. LCOG compiled a report on these documents in regards to their compatibility with the Hazard Mitigation Plan. Each jurisdiction reviewed their capability portion individually and responded by electronic confirmation or by confirming in individual meetings.

Update the Mitigation Plan

To begin the process of updating the plan, originally developed in 2004, at the first meeting on February 5, HMSC worked to update goals and objectives for countywide mitigation efforts. These goals represent the county and communities' vision for disaster resistance. The HMSC also reviewed the previous action items, with each community representative being assigned to update his/her portion of previous action list. They were also charged with defining new actions and goals.

Communication was made frequently through electronic means throughout this process. LCOG staff received many of their action list updates through e-mails, but the primary source of updates to the actions and goals was through individual staff meetings and meetings of the entire Steering Committee. They also received updates to other items, and the staff were frequently in contact with community representatives to ensure accuracy.

At the September 25th meeting, the HMSC reported on the status of mitigation actions for implementation. The results were recorded to be reflected in this plan. Furthermore, new mitigation actions were suggested, many of them building on current Regional cooperation among the jurisdictions. Everything that could affect hazard event-related damage in the county was considered by the HMSC, with special consideration of the National Floodplain Insurance Program (NFIP). The role of LCOG advisors was to ensure not only that relevant activities were considered, but also that the process was not limited to just a few alternatives. LCOG staff informed the HMSC members that they would visit each of them to go over individual considerations in the Hazard Mitigation Plan Update. The status of some sections of the plan (such as the Vulnerability and Capability assessments) was discussed.

Evaluate Your Work

The County will continue to implement the plan and perform periodic reviews and revisions of the plan through on-going HMSC reviews. The HMSC will meet at least annually to review the plan and will also hold public meetings to garner citizen comment. Specific language on the HMSC's future endeavors to continue to evaluate the plan is included in the Action Plan.

A Regional Approach

There is a long and successful tradition in the Lowcountry for local governments and their agencies to work together—both formally and informally—to provide services to area residents, especially in times of natural disasters. Transportation planning, law enforcement and firefighting, watershed improvements, housing neighboring local governments that have been evacuated in the face of oncoming natural disasters and emergency response mutual aid agreements are a just a few of successful initiatives between jurisdictions. As a guiding principle, this plan aims to build on and improve regional cooperation, which is now reflected in the goals and actions within this document.

Vital networks such as transportation systems, utilities, and watersheds are highly interconnected despite political boundaries and require the cooperation of multiple jurisdictions due to the large and complex scale of service provision. Taking these factors into account, as well as the unique topographic features of the Lowcountry, and the proximity to the ocean, it is imperative for local officials to continue to be able to plan and work together before, during, and after a natural hazard event.

Although Beaufort County's plan is a standalone document, the planning process in which all four Lowcountry counties joined in the HMSC, developed common goals and objectives, and established interjurisdictional strategies is reflective of the regional approach. For example, during the stakeholder meetings it was found that there is a need for increased coordination between the Counties and SCDOT, FEMA, and SCMED in regard to reimbursement for debris removal following a natural hazard; among the counties this work is being done, as part of the ongoing Regional cooperative approach to natural disasters, but there are impediments to one jurisdiction being reimbursed by senior levels of government for that work across the boundary line in another county. Therefore, a new mitigation action recommends convening future discussions between these stakeholders on specific issues regarding reimbursement and agreements.

This Regional approach will assist in meeting the overall goals, detailed later in the Plan, will focus on certain actions that will benefit multiple jurisdictions:

- Regional storage, warehousing and distribution of supplies and equipment mutual assistance agreements among counties and SC- DOT
- Transportable shared generator capacity

Public Involvement

The public involvement strategy in the Hazard Mitigation Planning process was guided largely by the goals set by the HMSC which included the need to explore social media and other electronic means in efforts to bring greater awareness of hazard preparedness. As people increasingly rely on electronic communication, public service agencies have found it necessary to adapt traditional strategies of engagement to the evolving landscape of digital media. These media have found beneficial application in planning at the regional level, as well as the local level, for their ability to quickly and efficiently distribute messages and gather responses.

Taking these factors into account, LCOG, along with partners in the HMSC developed a public involvement strategy which utilized social media such as Facebook and Survey Monkey to convey information relating to the HMP process and to solicit public input. LCOG Planning Department developed two Facebook pages, one for the department itself, and one for HMP process. Secondly, LCOG developed a household survey which explored Lowcountry residents' experiences and perceptions of natural disasters, mitigation actions taken by individual households, as well support for community-wide mitigation efforts. The

survey was designed based off an analysis of hazard surveys used in communities around the country, previous surveys used by LCOG, and a review of best practices in survey administration. These sources guided the wording of questions, the length of the survey (intentionally short at 10 questions), and the type of data that citizens could be reasonably expected to provide.

LCOG offered the survey through the Facebook pages as well as partnering with local politicians, public agencies, and regional media to share or publicize the survey. Therefore, area residents had a variety of opportunities to access the survey, either on town and county websites, social media, or email blasts. Through this coordinated effort, the HMP garnered an almost unprecedented amount of public attention, and over 500 survey responses were recorded in Beaufort County alone.

Overall, survey responses reflected to a large degree the challenges and mitigation strategies identified during the HMP process. For example, respondents overwhelmingly support investments in emergency services, but also improvements to codes and ordinances which increase standards for new development. These types of strategies are considered high priority among the mitigation actions for the County and municipalities, which support this public input. In terms of preference for receiving information about hazards, television was most supported, followed by email and conventional mail. This data affirms community outreach strategies used by most jurisdictions, and would support their continuation. For a full analysis of the survey and summary statistics of responses please refer to Appendix D.

As part of the outreach campaign, a presentation to the LCOG board of directors occurred on October 22, 2015, which was open to the public and publicized with the agenda. This body is comprised of 30 elected mayors and council members from the four-county region, including Beaufort, Colleton, Hampton, and Jasper Counties. The presentation concentrated on the region's shared and differing conditions, such as sociodemographic factors and building trends. The presentation explained the completed and proposed actions. Members were encouraged to spread the word about the Plan and follow-up with comments or concerns.

Federal Funding Sources for Mitigation

In preparing the hazard mitigation plan and identifying potential mitigation measures, the committee also had to consider potential funding sources for the specified projects. An overview of several federal and state funding sources that can be used for hazard mitigation projects is provided below. Preparations are being made to apply for grants once FEMA approves this update.

FEMA's Hazard Mitigation Grant Program (HMGP) assists states and local communities in implementing long-term hazard mitigation measures following a major disaster declaration. As of November 1, 2004, all communities must have an approved hazard mitigation plan in place to remain eligible for HMGP funding. HMGP grants can be used to fund projects that provide protection to either public or private property. HMGP eligible projects include structural hazard control such as debris basins, floodwalls, or stream

restoration, and retrofitting measures such as flood proofing, acquisition, or relocation of structures.

FEMA can fund up to 75 percent of the eligible costs of each project. The State or local match does not have to be cash; in-kind services or materials may be used. Federal funding under the HMGP is based on 7.5 percent of the Federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster. Eligible applicants must apply for the HMGP through the South Carolina Emergency Management Division Recovery and Mitigation Group.

FEMA's Pre Disaster Mitigation (PDM) **Funds** provide both planning and project funding to eligible communities. PDM project funding is nationally competitive; there is no 'base' amount guaranteed to each state. A national priority is placed on projects that address NFIP repetitive loss properties and a benefit/cost analysis is required for each proposed project. Projects are awarded priority based on the state's analysis and resulting ranking, and on factors such as cost effectiveness, addressing critical facilities, and the percent of the population that benefits from the project.

FEMA funds up to 75 percent of the cost of the project, or up to 90 percent for small, impoverished communities. There is a $3 million cap on the federal share of the cost per project. Eligible applicants must apply for the PDM through the South Carolina Emergency Management Division Recovery and Mitigation Group.

FEMA's Flood Mitigation Assistance Program (FMA) provides grants to states and communities for planning assistance and mitigation projects that reduce the risk of flood damage to structures covered by flood insurance. The types of grants available include planning and project assistance. FMA monies are available to eligible applicants when a Flood Mitigation Plan has been developed and FEMA has approved it.

FEMA may contribute up to 75 percent of the total eligible costs. At least 25 percent of the total eligible costs must be provided by a nonfederal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. There are limits on the frequency of grants and the amount of funding that can be allocated to a state or community in any 5-year period. The South Carolina Department of Natural Resources (SCDNR) serves as the administrator of the planning and projects portions of the grant. The State's FMA Coordinator is within the Land, Water and Conservation Division of SCDNR. The agency's web page is www.dnr.state.sc.us.

Continuing Authorities Program (CAP) initiates a short reconnaissance effort to determine Federal interest in proceeding. If there is interest, a feasibility study is performed, and then the project might move on to a plans and specifications phase. Finally, the project goes to its construction phase. A local sponsor must identify the flood-related problem and request USACE Assistance. Small flood control projects are also eligible.

The cost share for the CAP is 65% USACE and 35 % local. The federal project limit is $7,000,000. The USACE's Charleston District office would review the local sponsor's request for assistance and would request funds from the USACE's annual appropriations.

USACE's Floodplain Management Services Program aims to support comprehensive floodplain management planning to encourage and guide sponsors to prudent use of the Nations' floodplains for the benefit of the national economy and welfare. Some examples of the types of projects that would be funded include:

- flood warning and flood emergency preparedness
- floodproofing measures
- studies to improve methods and procedures for mitigating flood damages
- preparation of guides and brochures on flood-related topics

A local sponsor must identify a problem and request USACE assistance under the Floodplain Management Services Program. The USACE may provide up to 100% of funding at the request of the sponsor. The USACE's Charleston District's office would review the local sponsor's request for assistance and determine if it fits within the program.

Department of Housing and Urban Development's (HUD) **Community Development Block Grant - Disaster Recovery Initiative** (DRI) program provides flexible grants to help cities, counties, and States recover from Presidentially-declared disasters, especially in low-income areas. Since it can fund a broader range of recovery activities than most other programs, the DRI helps communities and neighborhoods that otherwise might not recover due to limited resources.

When disasters occur, Congress may appropriate additional funding for the Community Development Block Grant and as DRI grants to rebuild the affected areas and bring crucial seed money to start the recovery process. Grantees may use DRI funds for recovery efforts involving housing, economic development, infrastructure and prevention of further damage, if such use does not duplicate funding available from the Federal Emergency Management Agency, the Small Business Administration, and the U.S. Army Corps of Engineers. Examples of these activities include:

- buying damaged properties in a floodplain and relocating them to safer areas;
- relocation payments for people and businesses displaced by the disaster;
- debris removal;
- rehabilitation of homes and buildings damaged by the disaster;
- buying, constructing, or rehabilitating public facilities such as water and sewer systems, streets, neighborhood centers, and government buildings;
- code enforcement;
- planning and administration costs (limited to no more than 20 percent of the grant).

HUD notifies eligible governments, which must then develop and submit an Action Plan for Disaster Recovery before receiving DRI grants. The Action Plan must describe the needs, strategies, and projected uses of the Disaster Recovery funds.

Certified Local Government (CLG) **Grants** are available for historic preservation through the **State Historic Preservation Office** (SHPO) which is part of the **South Carolina Department of Archives and History** (SCDAH). Although the funding for this program is administered by state, the funding is allocated by the U.S. Department of the Interior. Ten percent of the total federal appropriation to the State Historic Preservation Office's is awarded annually to Certified Local Governments (CLGs). The City of Beaufort and the Town of Bluffton are both Certified Local Governments and are thus eligible for this funding source. The grants can be used for projects related to historic structures and preservation, and requires matching funds (50/50 share) with awards generally ranging from $1,500 to $25,000. Historic Preservation projects often overlap with hazard mitigation efforts and include Identifying, Recording and Recognizing Historic Properties; Planning for Historic Districts and Multiple Historic Properties; Building Stabilization Projects; Planning for Individual Historic Properties; Preservation Education; and Strengthening Local Government Historic Preservation Programs.

The **SHPO** also administers the **State Development ("Bricks and Mortar") Grants** which can be used for stabilizing historic buildings and structures, or protecting historic buildings and structures from the adverse effects of the weather. Eligible applicants include local governments, nonprofit organizations applying for the grants for buildings or structures that are listed in the National Register of Historic Places or eligible for the National Register and have a planned or current public use. The grants are reimbursable, have a 50/50 cost match requirement and generally range from $5,000 to $20,000. The SHPO's website is located at www.state.sc.us/scdah/histrcpl.htm.

2. Hazard Identification and Profiles

Introduction

Beaufort County performed a Hazard Identification to determine the hazards the County faces. The hazard identification section describes each hazard, describes the extent of severity of each hazard, provides the previous occurrences of hazards and describes the probability of future occurrences of each hazard based on historical data. While each hazard is described in narrative form, with its corresponding probability also included, Table 2-14 (at the end of this section) serves a quick reference guide that shows the annual probability, the hazard and jurisdictions affected. The results were presented to the Committee members for review, and data and additional events were added.

To perform this process, existing sources of hazard frequency data were consulted including Flood Insurance Rate Maps (FIRMs), FEMA publications, Department of Agriculture Forest Service wildfire risk maps, USGS earthquake and landslide risk maps, storm surge mapping developed by NOAA, State of South Carolina erosion information, and wind and climatic data. Historical hazard events were researched through state and federal agency information to determine their effects on the County and their probability of recurrence. **Since it is the most recent and deemed to be most reliable, the information provided by the SC Hazard Research Labs (drawn from NCDC data) was the primary data source for profiling hazards in Beaufort County. NCDC data itself was also utilized. Unless otherwise noted, these are the authoritative data sources for this planning document.**

The Hazard Identification process was used to identify those hazards that pose the greatest risk to the County and warrant further analysis through the vulnerability assessment. Hazard threats are evaluated at the regional as well as the local level, whereas areas nearer the coast are more susceptible to flooding and hurricane hazards.

For purposes of this plan, when “Beaufort” or “Beaufort County” is used, that is generally used to refer to the County and all municipalities in the County. Overall, all municipalities are affected the same in terms of probability and vulnerability for each hazard. If there is a notable or meaningful difference between jurisdictions, it is noted specifically (such as Hilton Head and beach erosion).

Hurricanes, Tropical Storms

Hurricanes and tropical storms, as well as tropical depressions, are all tropical cyclones which are defined by the National Weather Service’s National Hurricane Center (NHC) as *warm-core non-frontal synoptic-scale cyclones, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center*. According to the NHC, once they have formed, tropical cyclones maintain themselves by extracting heat energy from the ocean at high temperatures and releasing heat at the low temperatures of the upper troposphere. Hurricanes and tropical storms bring heavy rainfalls, storm surge, and high winds, all of which can cause significant damage. These

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storms can last for several days, and therefore have the potential to cause sustained flooding, high wind, and erosion conditions.

These types of storms are classified using the Saffir-Sampson Hurricane Scale which was developed by Herbert Saffir and then director of the National Hurricane Center, Robert Simpson. The scale rates the intensity of hurricanes based on wind speed and barometric pressure measurements and is used by the National Weather Service to predict potential property damage and flooding levels from imminent storms. Although the scale assigns a wind speed and surge level to each category of storm, in recent years, there has been more and more recognition of the fact that wind speed, storm surge and inland rainfall are not necessarily of the same intensity for a given storm. Therefore, there is some interest in classifying hurricanes by separate scales according to each of these risks. However, the Saffir-Sampson Scale is still the most widely used classification tool for hurricanes. The scale is presented in Table 2-1.

Table 2-1: Saffir-Sampson Scale and Typical Damages

Category	Sustained Wind Speeds (mph)	Surge (ft)	Pressure (mb)	Typical Damage
Tropical Depression	<39	--	--	--
Tropical Storm	39-73	--	--	--
Hurricane 1	74-95	5-Apr	> 980	**Minimal** – Damage is done primarily to shrubbery and trees, unanchored manufactured homes are damaged, some signs are damaged, no real damage is done to structures on permanent foundations.
Hurricane 2	96-110	8-Jun	965-980	**Moderate** – Some trees are toppled, some roof coverings are damaged, major damage is done to manufactured homes.
Hurricane 3	111-130	12-Sep	945-965	**Extensive Damage** – Large trees are toppled, some structural damage is done to roofs, manufactured homes are destroyed, structural damage is done to small homes and utility buildings.
Hurricane 4	131-155	13-18	920-945	**Extreme Damage** – Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail' some curtain walls fail.
Hurricane 5	> 155	> 18	< 920	**Catastrophic Damage** – Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, some buildings fail completely.

Source: National Hurricane Center

Nor'easters are extratropical storms occurring during the period from late fall to early spring that affect the east coast of the U.S. Low pressure systems develop off the east coast that lead to storms that bring strong northeast winds, heavy rains/precipitation and storm surge to coastal areas. Although nor'easters' winds and storm surge might be less intense than that of hurricanes, nor'easters can hover for several days over a given area. This kind of long duration storm allows larger accumulations of precipitation as well as more damage to structures as they are exposed to wind and flooding for long periods of time. Additionally, the long duration of nor'easters typically leads to widespread coastal change through erosion and accretion along the shoreline.

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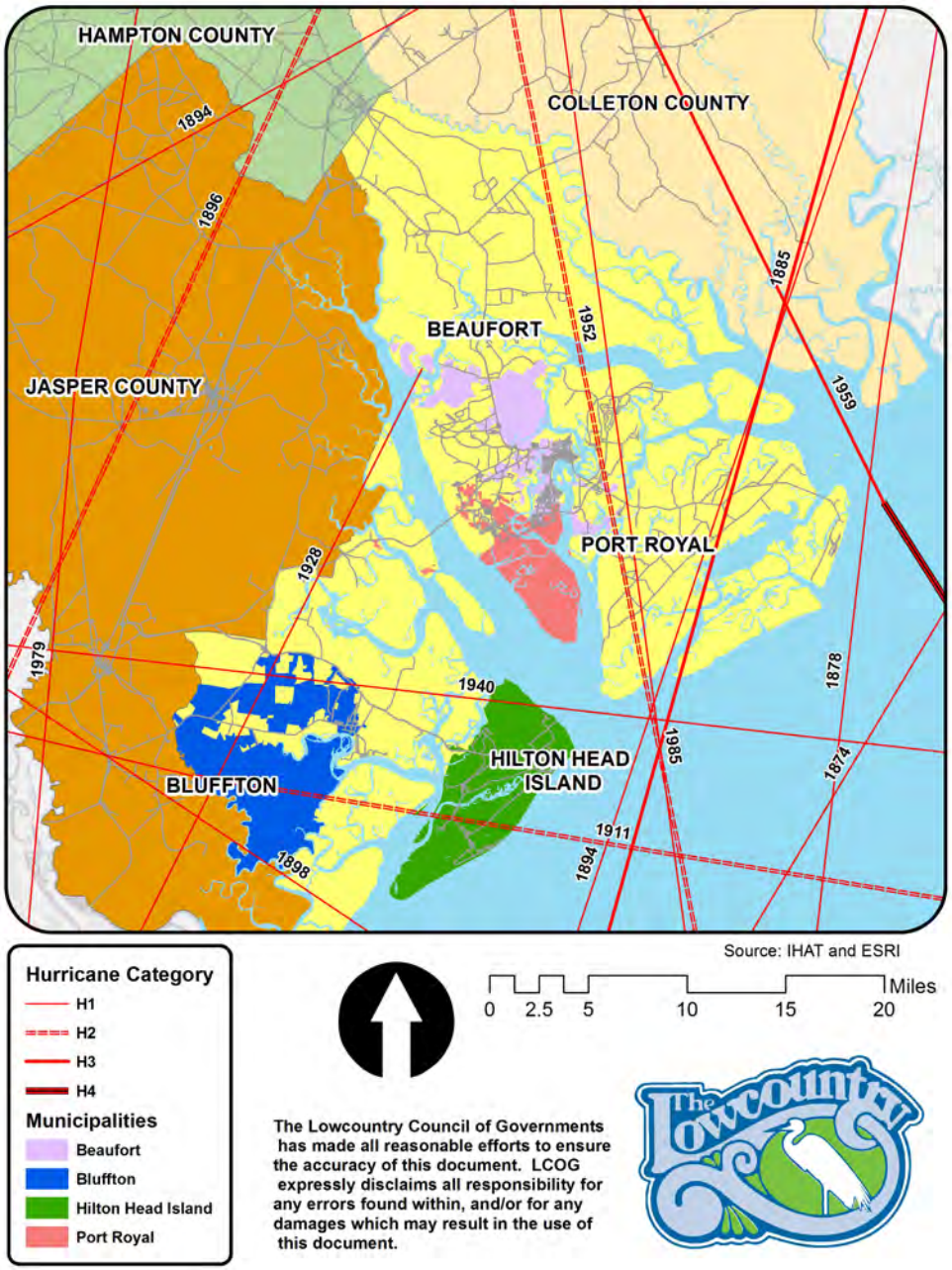
Past Occurrences of Hurricanes

Hurricane track data gathered from the South Carolina State Hazard Assessment (performed by the South Carolina Emergency Management Division in conjunction with the University of South Carolina Hazards Research Lab) indicates that from 1850 to 2015, 20 storms passed directly through Beaufort County. These included tropical storms, tropical depressions, subtropical storms, subtropical depressions and extratropical storms. Figure 2-1 illustrates hurricane paths within the County.

Figure 2-1: Hurricanes Beaufort and Surrounding Counties, 1850-2015



A summary of the types and numbers of hurricanes and other storms is provided in Table 2-2. The data included in that table represents that data from the coastal services center of the original plan as well as storms from the Hazard Lab.

Table 2-2. Storm Tracks Passing Through Beaufort County 1850-2015

Type of Storm	Quantity	Named
Hurricane – Category 3	1	
Hurricane – Category 2	2	
Hurricane – Category 1	5	
Tropical Storm	10	
Tropical Depression	2	1 - occurred prior to naming convention
		1 – Yes
Subtropical Storm	1	No
Subtropical Depression	1	Yes
Extratropical Storms	2	Both Named

Source: SCHRL

Hurricanes that pass in relatively close proximity to Beaufort County can also have an impact upon Beaufort County. Therefore, an analysis of storms passing through or within 50 miles of the County was also performed. Results of this analysis are presented in Table 2-3.

Table 2-3. Storm Tracks Passing within 50 miles of Beaufort County 1850-2015

Type of Storm	Quantity
Hurricane – Category 4	2
Hurricane – Category 3	3
Hurricane – Category 2	5
Hurricane – Category 1	15
Tropical Storm	39
Tropical Depression	7
Subtropical Storm	3
Subtropical Depression	2
Extratropical Storms	5

Source: SCHRL

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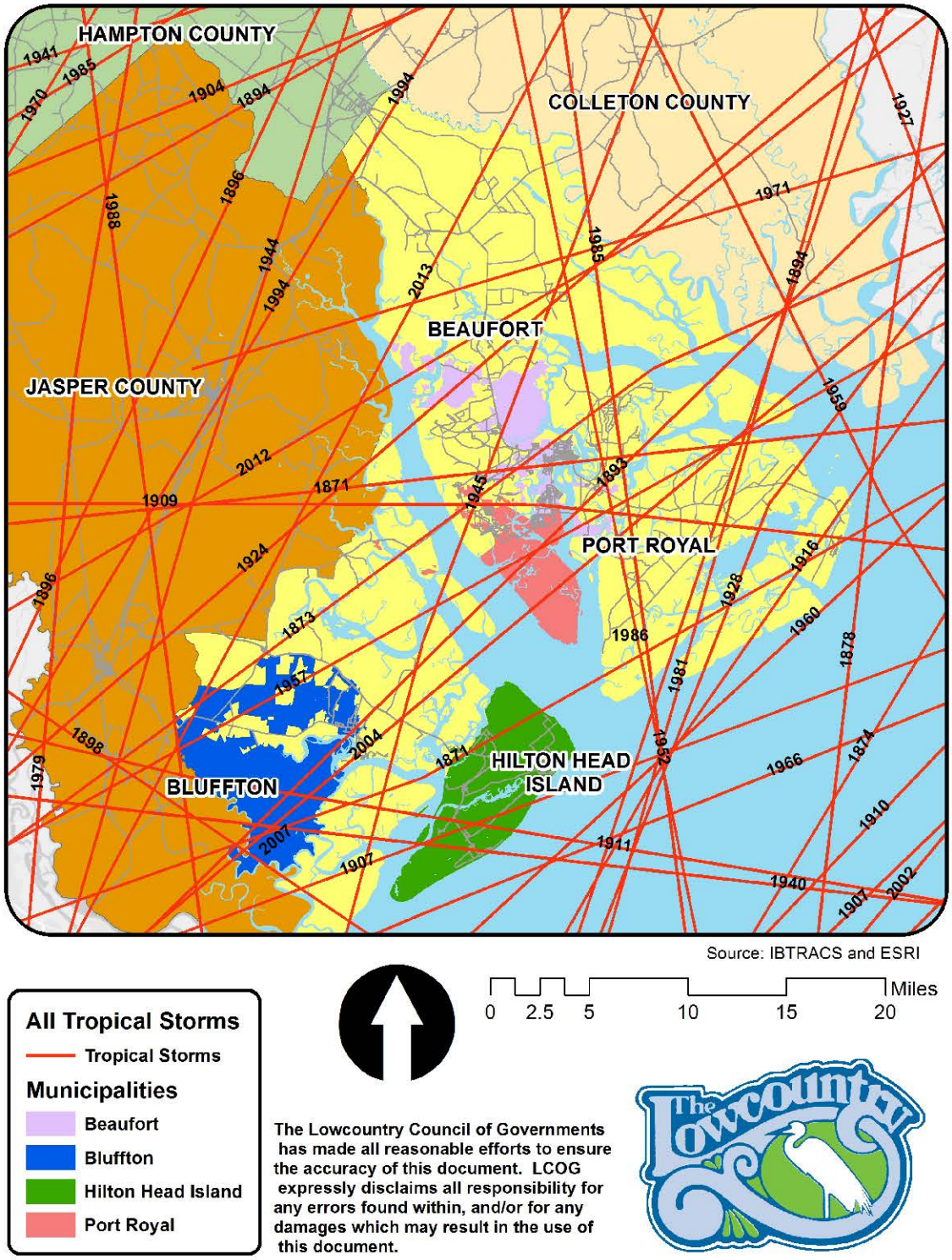
Figure 2-2: All Tropical Storms Including Hurricanes, 1850-2015



As is evident in data from the Hazard Research Lab, Beaufort County has had many encounters with tropical cyclones since the beginning of record keeping in the area. In the section that follows, several storms are highlighted with a more in depth examination of the impact that each had on the region.

September 1804

A hurricane moved inland between Savannah, Georgia and Charleston, South Carolina on September 7 and caused severe damage along the coastline of both states. The center of the storm stayed along the inland side of the coastline and passed over the City of Beaufort. Records indicate that this storm caused over 500 persons to drown in South Carolina and severely impacted the State's economy.

August 1854

The center of this hurricane passed about 20-25 miles southeast of Beaufort County changing from a Category 3 storm to a Category 1 storm as it made its way over land. It approached the coastline from a south-southeasterly direction bringing winds that caused significant storm surge as they drove waters inland from the ocean into the tidal estuaries and over the tidal lowlands of Beaufort County.

August 1893

This hurricane went from a Category 3 to a Category 2 hurricane as its center approached the north Georgia coastline. The center of the hurricane passed 10-15 miles west of southern Beaufort County. The hurricane approached the coastline from the southeast and thus caused extensive storm surge along the coast. Surge levels on the North Georgia and lower South Carolina coasts reached up to 19.5 ft NGVD at Savannah Beach in Georgia, and 8.9 ft NGVD in Charleston. It is estimated that over 1,000 people along the coastal islands and lowlands from northern Georgia to Charleston, South Carolina died as a result of this storm.

October 1902

A hurricane moving from the Gulf of Mexico became an extratropical storm as it passed over Beaufort County bringing 3.4 inches of rain to the County during a 12 hour period on October 10 and 11, 1902.

August 1940

This Category 1 hurricane came from the southeast and made landfall in Beaufort County on August 11, 1940. Winds from the hurricane created surge in Beaufort's tidal estuaries and caused the Beaufort River to leave its banks and reach a height of 14.2 ft. NGVD. On the Broad River on Lemon Island, a surge level of 16 ft. NGVD was recorded. On outlying

DRAFT

islands including St. Helena, Hilton Head, Daufuskie and Pinckney, flood levels reached 10 ft. NGVD.

In Beaufort City, every wharf along the Beaufort River was damaged or destroyed and the business district was flooded to depths of 2 to 3 feet. On Lady's Island, flooding caused the deaths of 8 people. Severe damage was also reported on the outlying islands of St. Helena, Hilton Head, Daufuskie, and Pinckney where numerous homes were damaged or destroyed, several hundred people were left homeless, and 25 people lost their lives. At Hunting Island, severe beach erosion was reported causing the beach line to recede up to 100 feet. This hurricane caused the deaths of 34 people in total and damage estimated at $6.6 million (1940 costs).

October 1944

This storm passed through Beaufort County as a tropical storm on October 19-20, 1944 and brought heavy rains to the area. The storm center's track shows the storm entered southern Beaufort County at Daufuskie Island and traveled northwest tracing a long path through the County and entering into Colleton County north of the Williman Islands (St. Helena Sound Heritage Preserve). Damage estimates from the storm were fairly low with property damage of approximately $200,000 and crop damage estimated at approximately $150,000 (1944 costs).

Hurricane Cindy – July 1959

Hurricane Cindy came ashore from the southeast into Charleston County as a Category 1 storm with winds of 75 mph. The eye of the storm was located near McClellanville, about 50 miles northeast of Beaufort County, when it made landfall. Cindy caused one death, high tides and considerable flash flooding.

Hurricane Gracie - September 1959

Hurricane Gracie came from the southeast and caused storm surge to reach between 7.3 and 11.9 ft NGVD at Edisto Beach (just north of Beaufort County at the border of coastal Colleton and Charleston Counties). The hurricane's center track went through St. Helena Sound and made landfall just northeast of Beaufort County in Colleton County. The hurricane was downgraded from a Category 4 to a Category 3 storm as it made landfall. Severe damage was reported from the City of Beaufort northward to Charleston including damage caused by fallen trees and crop damage. Considerable precipitation as well as several tornadoes resulted from the storm. The total storm damage was estimated at $14 million (1959 costs).

DRAFT

Hurricane Donna – September 1960

Hurricane Donna was a Category 2 storm that passed offshore of Beaufort County moving parallel to the coastline. The hurricane was reportedly 50-70 miles from the coastline, but resulted in squalls and gale-force winds along the coast. No significant damage or casualties were reported for this storm.

Hurricane David – September 1979

David made landfall as a Category 1 storm well south of Beaufort in McIntosh County, Georgia after causing severe destruction in the Caribbean. The storm had winds of up to 85 mph and its center passed within 6-7 miles of southern Beaufort County on September 4, causing minor to moderate damage and significant beach erosion.

Hurricane Bob – July 1985

The center of Hurricane Bob made landfall on Fripp Island in Beaufort County as a Category 1 Storm on July 25 and moved northwestward through the county. There was minimal damage associated with the storm and no deaths as a direct result.

Hurricane Hugo – September 1989

While Hurricane Hugo, which made landfall on the South Carolina coast on September 22, 1989, was the first major hurricane to hit the South Carolina coast since Hurricane Gracie, and the strongest hurricane to ever make landfall in the state (It was a Category 4 storm when it made landfall in Charleston County with sustained winds of 135 mph.), it did not cause significant damage in Beaufort County. However, a hurricane evacuation warning was issued in the county leading to a loss of revenue for many businesses particularly in resort areas including Hilton Head Island. Twenty-four (24) counties in South Carolina, including both Colleton and Charleston Counties located just north and northeast of Beaufort County, were Presidentially-declared disaster areas, and damage estimates for the state as a result of the storm were estimated at approximately $5.9 billion (1989 costs).

Hurricane Bertha – July 1996

Hurricane Bertha came close to the south coastal counties of South Carolina, but did not cause any significant damage. The maximum sustained winds (36kts) and peak gust (50kts) both occurred at the Charleston City Office on 7/12/96. Bertha's most significant impact was on tourism where the estimated loss revenue approached $20,000,000. Near eleven million dollars of that was in Beaufort/Hilton Head area. A few places along the Charleston coast experienced moderate beach erosion.

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Hurricane Floyd – September 1999

Hurricane Floyd weakened to a category 3 hurricane as it approached the southeast Georgia and southern South Carolina coasts on the morning of September 15th. The storm brushed the area during the late afternoon and evening as it took a more north and northeast course toward North Carolina. Sustained winds of tropical storm force were reported from Savannah on the southeast Georgia coast to Charleston on the South Carolina coast with wind gusts to hurricane force in the Charleston area. The highest sustained wind speed was 58 mph at the downtown Charleston office, which also had the highest gust (85 mph). In general, 3 to 5 inches of rainfall was reported across the area. Tides were 3.5 feet above normal with a maximum tide height 10.66 ft. ASL (7.71MLLW) at downtown Charleston. Minor to moderate beach erosion occurred along the South Carolina coast. Many businesses and homes suffered major damage with thousands of homes suffering at least minor damage in Charleston county, where 10.5 million dollars in damage was reported. Beaufort county reported 750,000 dollars in damages with Berkeley and Dorchester counties reporting 500,000 dollars each. Well over a thousand trees were down, which contributed to over 200,000 people across south coastal South Carolina being without power at times on the night of September 15. There were sporadic reports of roofs being torn from homes or businesses across the area.

Past Occurrences of Tropical Storms

Recorded data show only 55 tropical storms passing in or near Beaufort County between 1850 and 2015, but that number is likely to be unrepresentative of the true number of events, as a result of limited record-keeping in the earlier years. During the period from 2000 to 2015, the NCDC recorded 11 tropical storms that impacted Beaufort County. However, they caused only minor property damage, the largest amount being the erosion at Hunting Island in August 2008.

Future Probabilities of Hurricanes

Based on the frequency of past events, the occurrence of future events can be predicted. From Table 2.2, the center of eight hurricanes, one of which was a Class 3 hurricane, have passed directly through Beaufort County since 1850. Table 2-3 shows that the centers of an additional 17 hurricanes that have passed within 50 miles of Beaufort County. This includes two Category 3 and two Category 4 storms. That data reflects the NOAA Coastal Services Center data.

In order to estimate the frequency of occurrence, the number of hurricanes is compared to the length of the period of record which is from 1850-2015 and is 165 years. The recurrence interval is defined from this information and is a rough estimate of the amount of time, on average, during which one occurrence of a given storm will take place. It is important to note that in reality, a storm can occur multiple times during one recurrence interval, and that the recurrence interval is only an estimated average time period. Recurrence intervals for hurricanes and tropical storms within and in the vicinity of Beaufort County are presented in Table 2-4, which is included as a reference.

The SC Hazard Research Lab reports 20 such events in the same period of time. Using this data as the authoritative source for this planning document, an annual percent chance of a hurricane of 12.66 percent is calculated for Beaufort County. Taking into account both the

DRAFT

updated data and that data from the original plan, hurricanes are still considered a significant hazard, especially considering Beaufort's proximity to the Atlantic Ocean.

Table 2-4: Estimated Recurrence Intervals of Hurricanes and Tropical Storms within 50 miles of Beaufort County Since 1850

Storm Type	Number of Occurrences With Center of Storm Track Within 50 miles of Beaufort County	Recurrence Interval (Years)	Number of Occurrences With Center of Storm Track In Beaufort County	Recurrence Interval (Years)
Tropical Storm	41	4	12	14
Category 1	15	11	5	33
Category 2	5	33	2	82
Category 3	3	55	1	164
Category 4	2	82	no record	----------
Category 5	no record	----------	no record	----------
Tropical Storms and All Hurricanes	66	2	20	8

Source: SCHRL, NCDC

Past Occurrences of Nor'Easters

Major nor'easters that affected much of the East Coast occurred during March 1962 (the Ash Wednesday Storm), October 1991 (Halloween Storm), December 1992, March 1993, and January 1998. Records indicate that these storms generally had more of an effect on storm surge and flooding further north in the mid-Atlantic and northeast United States. The Ash Wednesday storm affected the coast from North Carolina to New England, just missing South Carolina. The effects of the Halloween Storm were felt along the mid-Atlantic and northeast coast as well as the North Atlantic Ocean.

The March 1993 storm caused high winds along the southeastern coast of the United States resulting in damage along beachfront and coastal properties. In Beaufort County, wind and storm surge destroyed the downtown Beaufort Marina, damaging or destroying approximately 2 dozen boats. Throughout the county, drainage ditches filled with debris carried by wind and floodwater which led to more severe flooding. On Fripp and Harbor islands, residents lost electricity for a week when salt water flooding led to damage of transformers. The January 1998 nor'easter brought heavy rainfall to the County causing significant roadway flooding. There were also reports of standing water in yards more than a foot deep.

Additionally, two storms occurred in October 1994 causing serious flooding as the slow-moving storms dropped several inches of rain on the county. A storm that occurred on October 3, 1994 dumped approximately 11.5 inches of rain on the county in a 24-hour period resulting in flash and coastal flooding. Many structures were damaged by floodwaters including an estimated 147 homes. Approximately 37 roads were washed out. Hilton Head

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Island was reportedly the hardest hit. A storm on October 13, 1994 led to flash and coastal flooding along the South Carolina coast with the southern counties being particularly hard hit. Runoff volumes were high and flooding was especially bad due to antecedent conditions; previous rainfall in the area had left the ground saturated. Beach erosion was reported at several locations along the coast as a result of this storm including a loss of an estimated 200,000 cubic feet of sand along Hilton Head Island. Conservative estimates for Beaufort County indicate that 218 residences and 15 businesses were damaged as well as wastewater treatment plants. Roadway flooding was also reported and the State Highway 21 Bridge over Whale Branch was closed. There is no data specifically for Nor'easters, but these storms are considered a serious threat to the entire County, along with hurricanes and other storms.

Flooding

Beaufort County is located along the Atlantic coast in southern South Carolina and is bordered by Jasper County to the west; Colleton County to the north, and Chatham County to the south. Beaufort, along with the three surrounding counties Colleton, Hampton and Jasper, is part of the Lowcountry of South Carolina. The highest elevation in Beaufort County is approximately 50 feet NGVD 29 (National Geoditic Vertical Datum of 1929) above sea level in its northern, inland area. The County is located on the low coastal plain and is comprised partially of tidal marshes and swamps. Several waterways flow through the County and ultimately into the Atlantic Ocean along Beaufort's coast. Figure 2.3 shows Beaufort County and its waterways. Beaufort County is highly susceptible to storm surge and coastal erosion along the Atlantic Ocean shoreline due to the relentless wave action and currents along the coastline. Storm surge threatens coastal areas as winds drive water towards the shoreline and can reach heights of 20 feet and be 50–100 miles wide. The county's flood vulnerability is also heightened by the fact that the county consists of low-lying land areas, including marsh areas adjacent to many of its waterways, and wide, relatively flat outlets where its streams and rivers meet the ocean.

A series of sea-islands including both barrier islands and erosion remnant islands are within Beaufort County. Barrier islands are located in the ocean and are the first areas of the County to be affected by seaborne storms. The origin of barriers is debated but is generally believed to be due to sand accretion along sand bars, or possibly due to the retreat of the ocean during the Ice Age combined with the effects of glacier meltdown. Barrier islands generally are prone to erosion along their northern ends, and accretion along their southern portions. Fripp and Hunting Islands are both barrier islands.

Erosion remnant islands are believed to be remnants of land that was once above sea level before Ice Age glaciers melted and raised the sea level. St. Helena and Port Royal Islands are erosion remnant islands. Hilton Head Island is actually a combination of the two types of islands. Broad Creek divides the northern erosion remnant island from the southern barrier island which have been fused together.

While a few of the County's numerous waterways are rivers with sizeable watershed drainage areas, most of them are tidal estuaries. The Combahee and Pocotaligo Rivers both have significant drainage areas. The Combahee River forms the northern border of Beaufort County. The Pocotaligo forms part of the border between Beaufort and Jasper Counties and

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empties into the tidally influenced Broad River. Some of the major tidally influenced water bodies within the County include: the Broad River which divides the northern portion of the County from the southern portion; Beaufort River which flows along the eastern edge of the City of Beaufort and the Town of Port Royal; the Coosaw River which flows in an easterly direction and empties into St. Helena Sound; the Chechessee and Colleton Rivers in the southern portion of the County; Calibogue Sound and Skull Creek which separate Hilton Head Island from the mainland of the County; and May, Cooper, and New River in southwestern Beaufort County.

The County's Flood Insurance Rate Maps (FIRMs) show that an estimated two-thirds (approximately 400 square miles) of the County's land mass lies within the 100-year floodplain, or Special Flood Hazard Area (SFHA). Within Beaufort County, the SFHA consists of A zones and V zones. The National Flood Insurance Program (NFIP) uses these general labels to mark areas subject to riverine and inland flooding (A zones) and coastal flooding (V zones) where flood hazards include velocity flows, wave action and erosion.

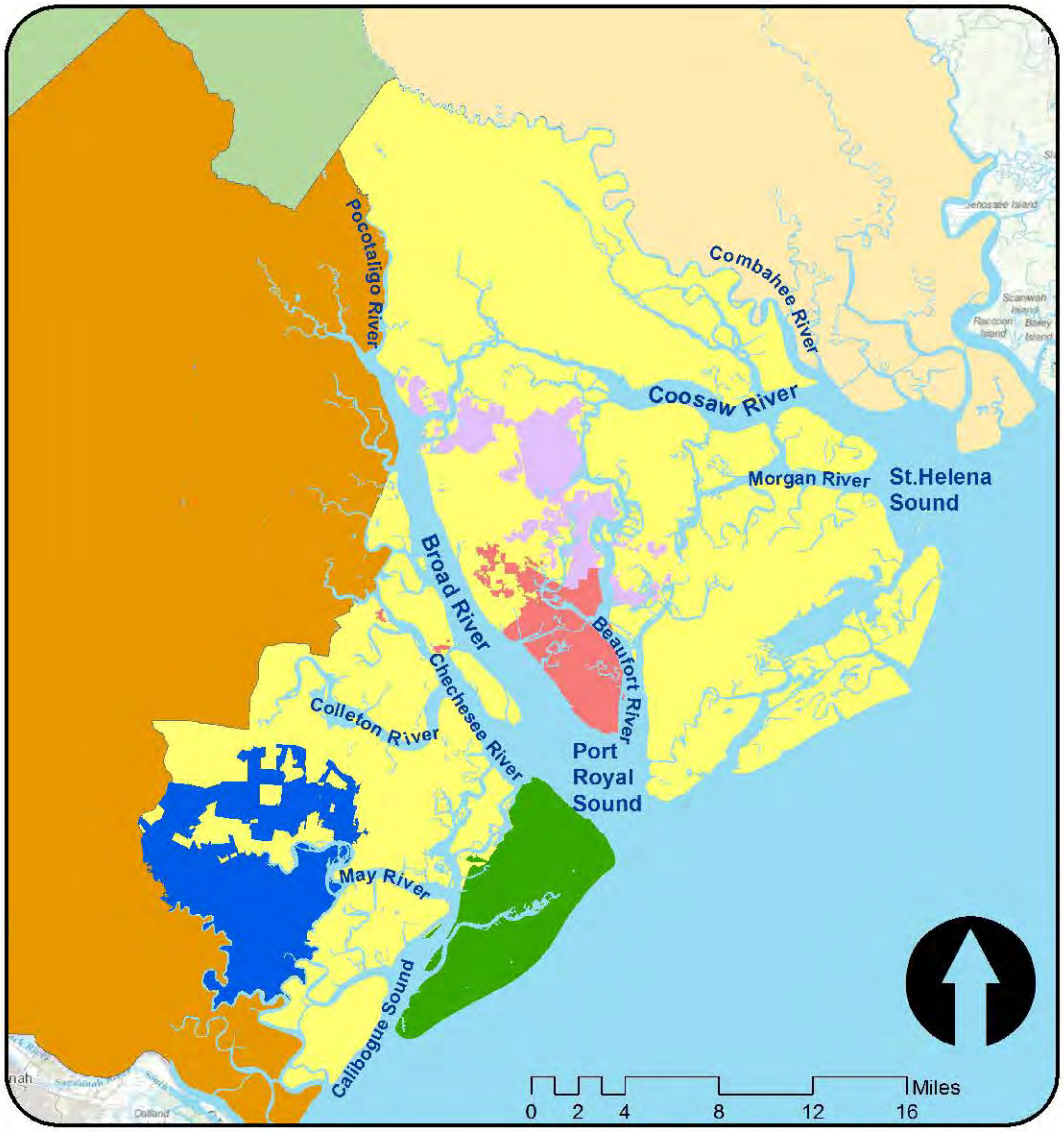
Most of the SFHA is designated as AE zone; the NFIP uses this label for riverine/inland areas of the SFHA where base flood elevations (BFEs), the elevations of the 100-year floodplain, are determined. In Beaufort County, within much of this AE zone, floodwater levels are controlled by tidal influences and storm surge levels. Beaufort County also has areas designated as VE zones, or Coastal High Hazard Areas. VE zones are parts of the SFHA that are prone to velocity/wave action at least 3 feet in height during a 100-year flood. The wave action that occurs during flooding in these zones generally causes more severe damage to structures, as well as erosion, than what is experienced in nearby A zones and riverine flooding areas. Several VE zone areas are found along the coast within the County. Figure 2-4 shows the Floodplain Zones within Beaufort County. Flood elevations within the County range from 22 ft NGVD within VE zones on Hilton Head Island to 8 ft NGVD in inland areas of the northern county.

Although there is not a specific NFIP designation for them, areas called Coastal A zones exist in coastal communities like Beaufort County. They appear as A or AE zones on the community's FIRMs, and are located adjacent to V zones. These areas are subject to some of the same flood hazards as V zones, including the effects of waves and velocity flow, but the magnitude of these effects is less. This is noteworthy because structures located in A zones adjacent to V zones often experience more extensive damage as a result of these effects than those in non-coastal A zones (FEMA, *Coastal Construction Manual*, 2000, Ch. 3). Generally, coastal A zones are defined as areas that are prone to velocity/wave action of 1 ½ - 3 feet in height during a 100-year flood.

Some coastal areas of the County are designated Coastal Barrier Resources Protection Act (CoBRA) zones. CoBRA was passed by Congress in 1982 to protect undeveloped, environmentally-sensitive coastal lands thus protecting natural resources and minimizing the loss of life and property damage caused by development in high-risk areas. Designated CoBRA zones are undeveloped coastal barrier systems. Within CoBRA zones, no federal

financing is available. Thus, federally backed flood insurance is not available if the structures are new or substantially improved (built or improved after October 1, 1983).

Figure 2-3. Beaufort County Waterways



Source: NOAA and ESRI

Beaufort
Bluffton
Hilton Head Island
Port Royal

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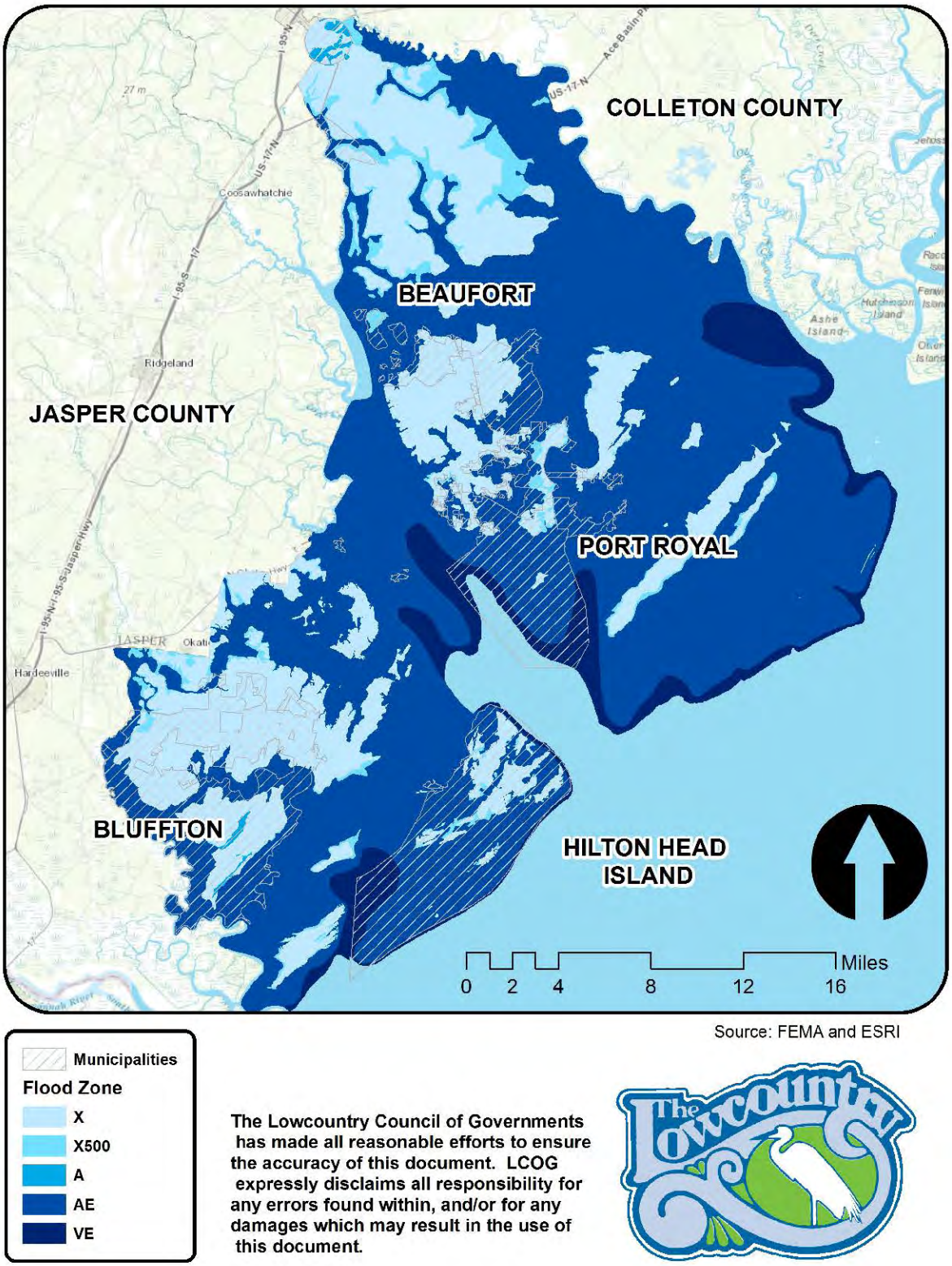
Figure 2-4: Beaufort County Flood Zones



Past Occurrences of Flooding

Data used to perform the State's risk assessment, which was processed by the University of South Carolina's Hazards Research Lab (HRL) and gathered from the National Climatic Data Center (NCDC) indicates that between 1950 and 2014 30 floods occurred in Beaufort County. Combined, the 30 floods caused a total of $22.5 million in property damage and 1.5 million in crop damage. No fatalities or injuries were reported as a result of the floods.

Beaufort County is susceptible to flooding caused by hurricanes, tropical storms and coastal storms such as nor'easters. According to the community's Flood Insurance Study, major storms and hurricanes caused severe flooding in 1787, 1804, 1893, 1940, and 1959. The highest storm surge recorded was for the August 11, 1940 hurricane event for which flood heights reached 14 ft NGVD 29.

Since the completion of the previous HMP update, there have been several significant flood events to affect Beaufort County. For example, on July 21st, 2014 heavy precipitation led to flash flooding on Hilton Head Island, stranding one motorist in three feet of water on North Calibogue Cay Road. A trained spotter reported six inches of water in a foyer and a completely flooded elevator shaft in one building on Lighthouse Road.

In early October of 2015 a powerful slow-moving low pressure system over the southeastern United States interacted with tropical moisture associated with Hurricane Joaquin hundreds of miles away in the Atlantic Ocean. The system unleashed unprecedented widespread torrential rains that persisted for more than 72 hours across South Carolina.

Storm surge combined with high tide and heavy rain caused coastal flooding at Edisto Beach, Charleston and numerous other communities up and down South Carolina's coast. Residents were asked to stay in their homes if safe. On Edisto Beach, some roads were closed for more than 24 hours, including the causeway, and motorists could not go on or off the island. In the City of Beaufort high water breached the seawall that runs along the Henry C. Chambers Park in the historic downtown and resulted in localized nuisance flooding, as well as the cancelation of the annual Shrimp Festival. Flooding was not substantial or widespread in Beaufort County, but statewide 15 deaths were reported, and what will undoubtedly be substantial losses in terms of property and infrastructure.

Heavy rainfall and flash flooding in the Central Midlands caused catastrophic damage to the transportation networks and potable water infrastructure. Dams failed, flooding numerous neighborhoods in the City of Columbia and surrounding areas. Substantial flood waters began to flow towards the Lowcountry through the Edisto River watershed and eventually Colleton County, where the river level crested at 16.08 ft. at Gavin's Ferry, the highest since 1945. Numerous nearby structures flooded, shelters were opened and roads were closed for more than a week as a Major Presidential Disaster Declaration was issued for Colleton County. As of this writing more than 170 individuals in Colleton County have applied for assistance through FEMA.

Statewide, over one billion dollars in damage to property and infrastructure resulted from this storm, according to current estimates.

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While Beaufort County remained mostly unscathed in this historic weather event, the crisis serves as a reminder of the entire regions' vulnerability to flood hazard with the expansive network of watersheds that not only drain Lowcountry soils, but also those of more landward areas. A slight variation in the pattern of that particular weather system may have resulted in much greater consequences for Beaufort County. Leaders in the region, whether in government, utilities, or service organizations can take lessons from the affected areas in terms of the nature of the emergency response, the types of infrastructure that were most vulnerable, and a great many other challenges.

Future Probabilities of Flooding

According to the data from the SC Hazard Research Laboratory, the percent chance per year of a flood (Hazard Frequency) is 46.88 percent. Flooding can be associated with a variety of weather events in addition to regularly occurring coastal conditions such as the king tides associated with astronomical patterns. Each one of these unique conditions deserves examination based on its potential to affect water levels around our developed areas.

Extreme Precipitation

It is important to recognize that while storm data from the NCDC and SCHRL does provide valuable insight into the previous occurrences of flooding, that this data does not provide an all-inclusive picture into the prevalence of flood events. The data relies on reporting from a variety of sources including news media, local authorities, private companies, and individuals. Therefore, analysis of baseline meteorological data, which is collected consistently with more rigorously defined criteria can serve to provide depth to our understanding of Beaufort County's vulnerability to flooding.

Historical precipitation data, points toward the increasing severity of the most extreme precipitation events. The following chart summarizes the extreme maximum daily precipitation occurring in Beaufort County by year from 1933-2002, the years for which bulk data was available. The data points represent the average of the highest daily precipitation event for the months of each year.

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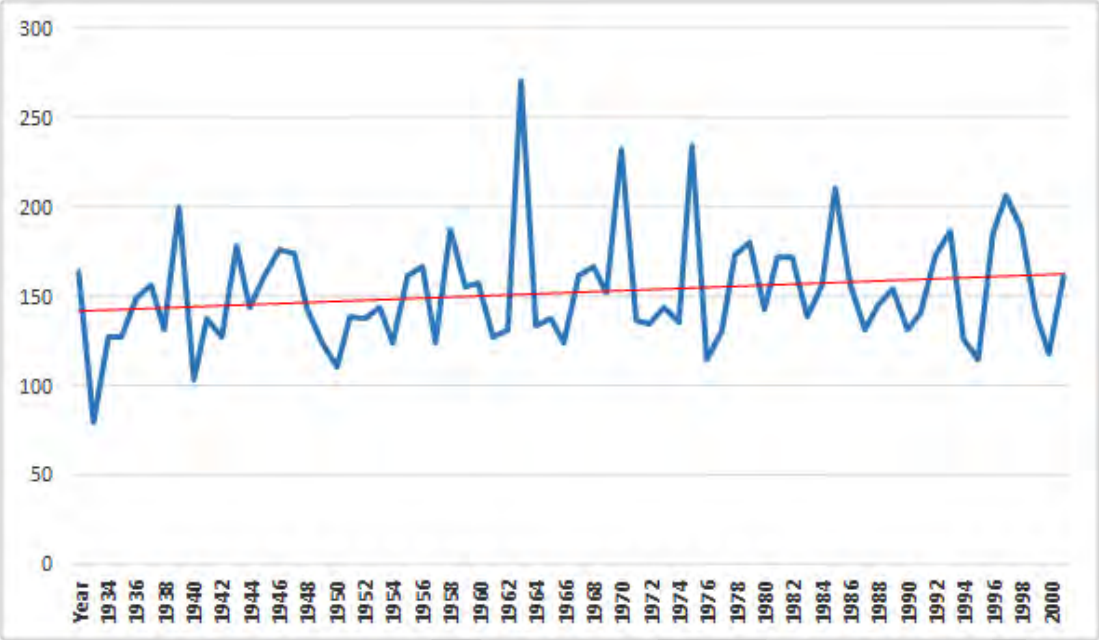
Figure 2-5: Average Monthly High Precipitation by Year 1932-2002 (Millimeters)



Source: NCDC

While the blue line indicates the wide variability in extremes of daily precipitation throughout the century, the red trend line points to a steady increase in the amount of precipitation occurring during these events. Historical events are among the factors used to predict future vulnerability to hazards, and if this trend continues, Beaufort County should expect to see higher levels of precipitation associated with extreme weather going forward. The implications of these data pertain not only to incidences of flooding, but to the standards used to design stormwater infrastructure.

Storm Surge

Storm surge is often modeled using the National Weather Service's (NWS) Sea, Lake and Overland Surges from Hurricanes (SLOSH) model. The model is used to predict storm surge heights based on hurricane category. Figures 2-6 and 2-7 show results from the SLOSH model for the southern and northern parts of Beaufort County respectively. Surge inundation areas are classified based on the category of hurricane that would cause flooding.

The SLOSH maps indicate that for a Category 1 Hurricane, a significant portion of the County, including the majority of Hilton Head Island, and portions of the Bluffton, the City of Beaufort and Port Royal would be inundated. Unincorporated areas including Fripp Island and the eastern portion of the Sheldon area would also be inundated by a Category 1 storm. As the category of the hurricane increases, more land area becomes inundated until in the case of a Category 5 storm, there are only pockets of land that are not inundated including some land within and adjacent to Bluffton, and an area located partially within the City of Beaufort and partially to its northwest (Gray's Hill). Storm surge is a major component of

northeaster storms along the east coast of the U.S. Because winds are moving from a north and/or eastward position, winds move across the ocean towards shore and form large waves.

Figure 2-6: Southern Beaufort County Storm Surge Map

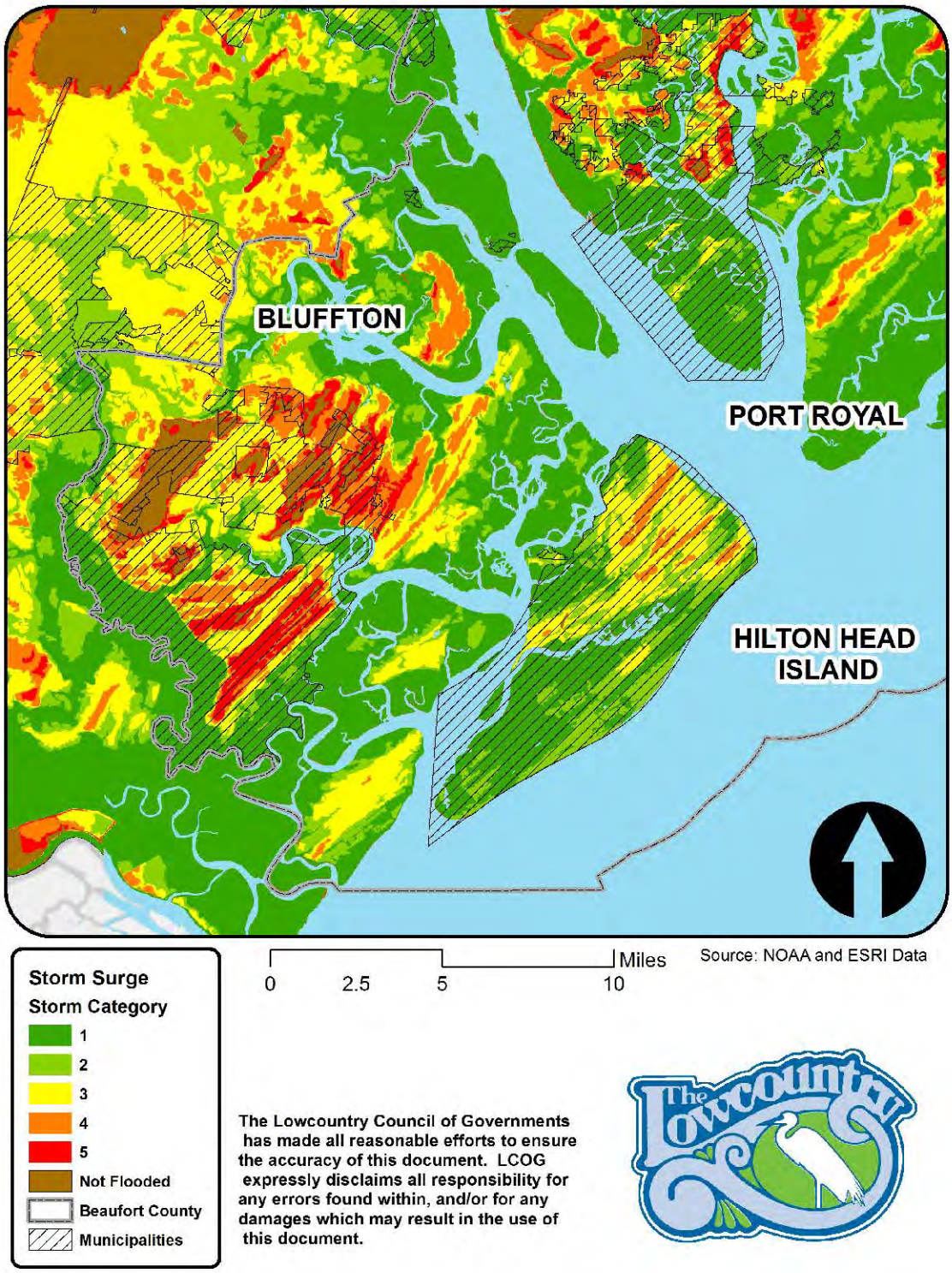
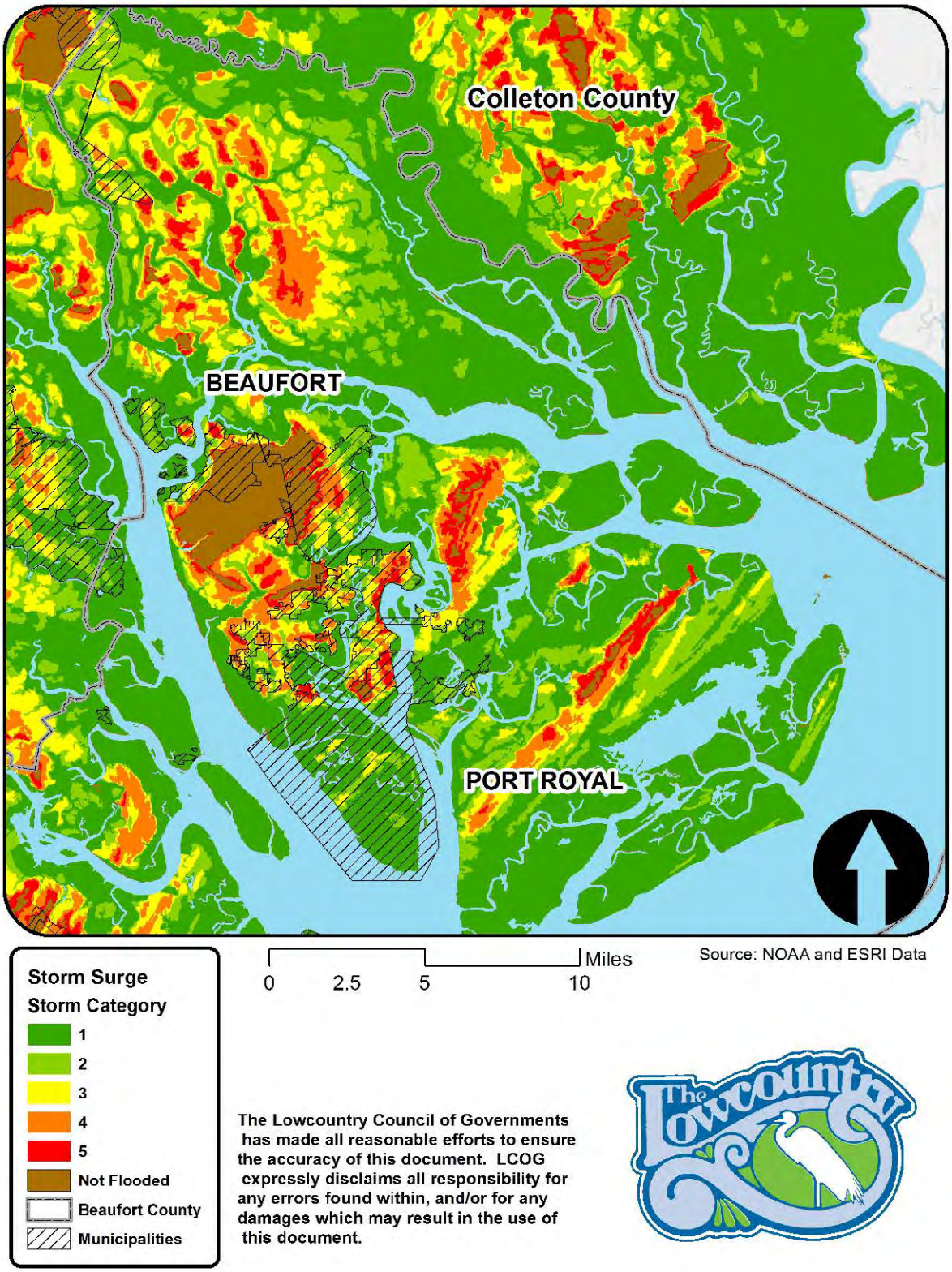


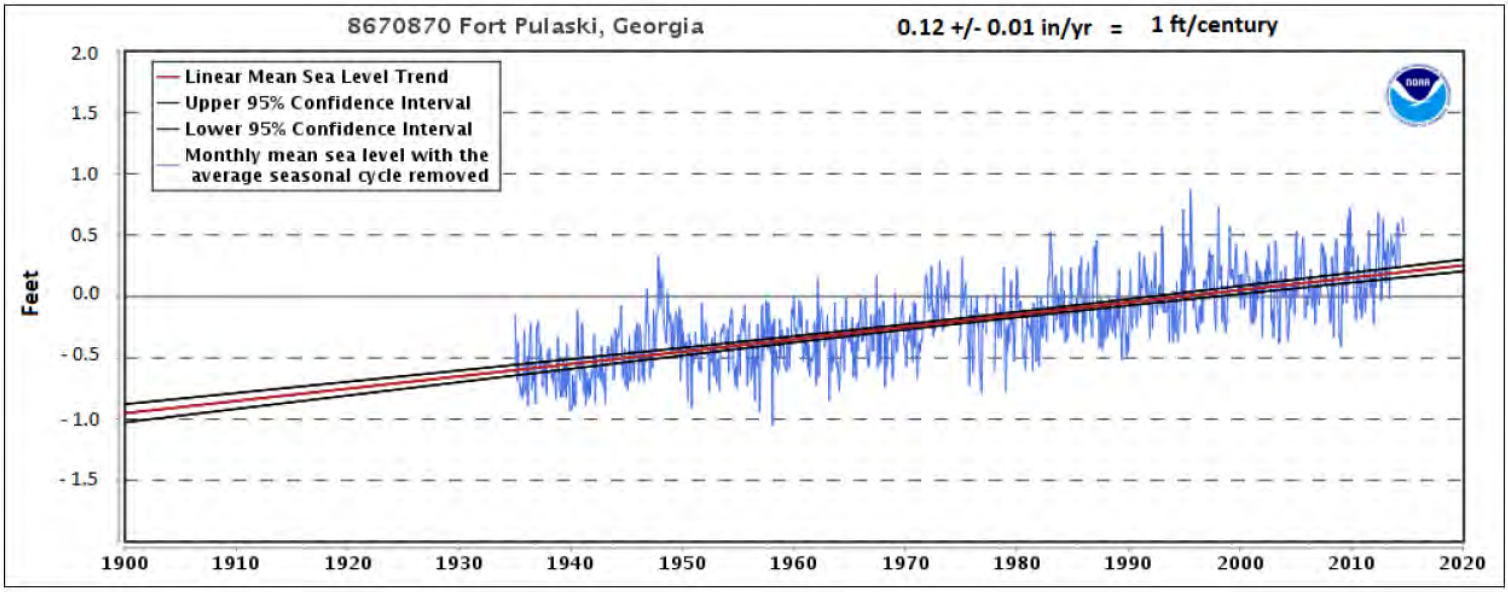
Figure 2-7: Northern Beaufort County Storm Surge Map



Sea Level Rise and King Tides

In 2015 the SC Sea Grant Consortium completed a report for Beaufort County on the potential effects of sea level rise on land management and strategies for adaptation. Rising sea levels are a widely documented historical trend, and data gathered since 1900 at the NOAA station in Fort Pulaski, GA, about ten miles from the Beaufort County line, shows levels rising one foot over the last century.

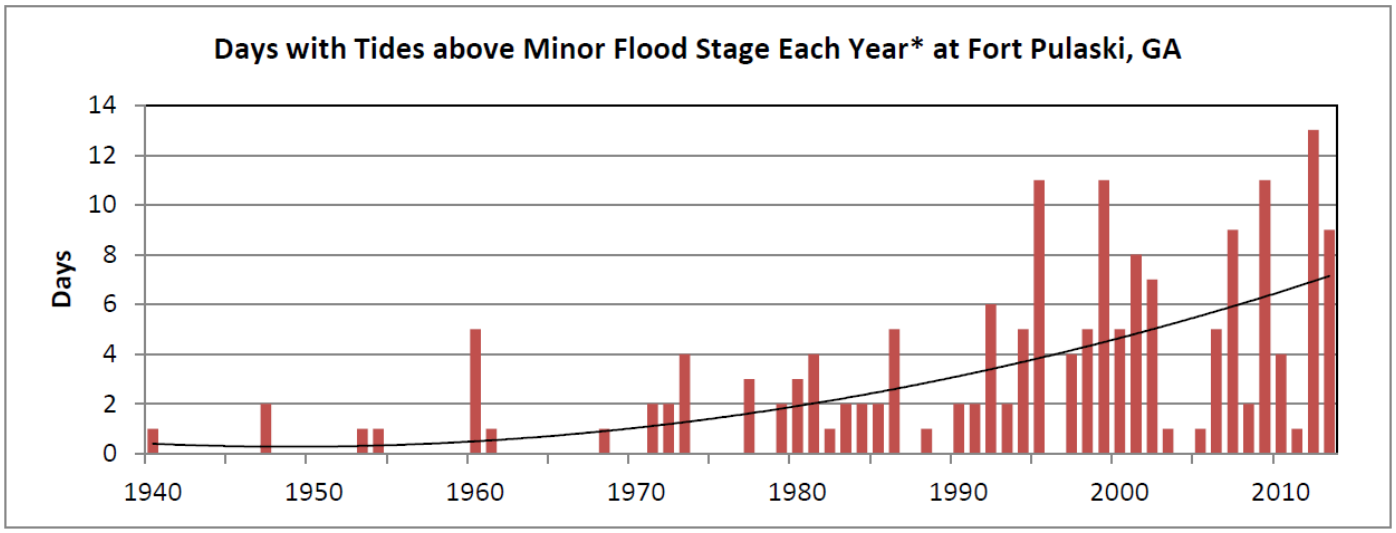
Figure 2-8: Historic Sea Levels at Fort Pulaski, Georgia



Source: SC Sea Grant, NOAA

Rising sea levels are attributed to the gradual melting of polar icecaps as well as thermal expansion, the process by which water expands as it warms. Land subsidence, the gradual sinking of land due to natural soil compact, or in some cases the withdrawal of subsurface resources, also contributes to higher water levels in low-lying coastal areas. While historical data points toward a foot per century increase, there is reason to believe that sea levels may increase more rapidly in the future. According to the SC Sea Grant report, the Fort Pulaski monitoring station has shown a gradual increase in the instances of tides at or above the minor flood stage (1.7 ft above MHHW).

Figure 2-9: Tidal Flood Events at Fort Pulaski. Georgia



Source: SC Sea Grant, NOAA

These increases in flood events could indicate that the process of sea level rise is accelerating as ice melt and thermal expansion occur more rapidly. The SC Sea Grant report therefore provides four scenarios developed by the NOAA National Climate Assessment for future sea level rise.

Table 2-5: SC Sea Grant Flood Scenarios

Scenarios	Description
Lowest	A scenario based on continuing historical trends from 1900
Intermediate-Low	A scenario incorporating thermal expansion.
Intermediate-High	A scenario based on thermal expansion and some ice melt.
High	A scenario based on the maximum glacial and ice sheet melt.

Source: SC Sea Grant, NOAA

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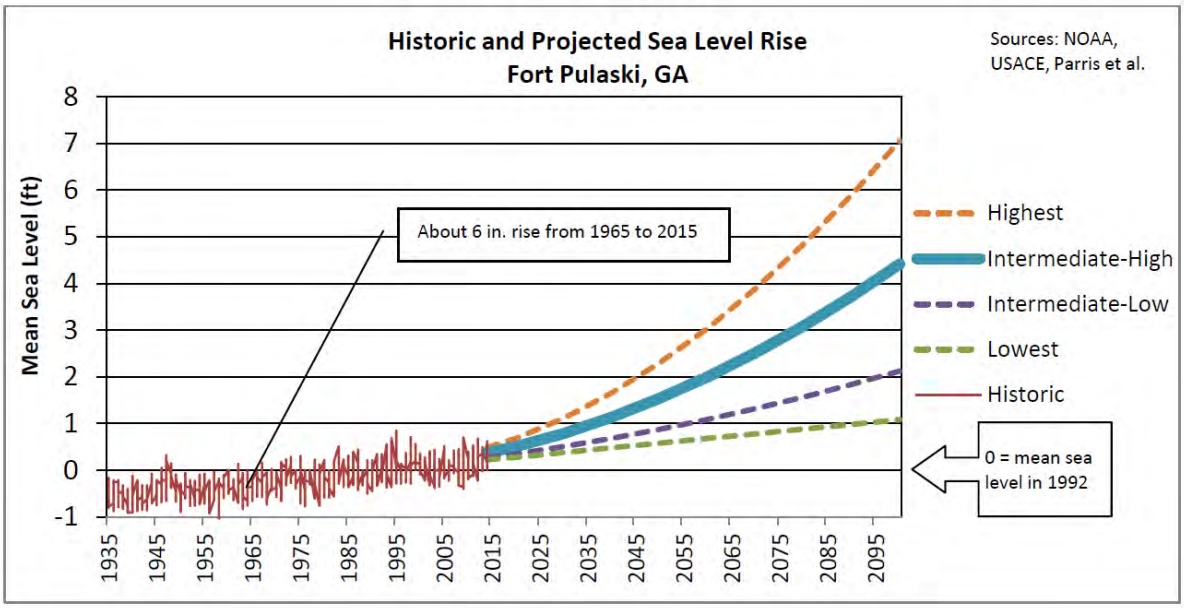
Figure 2-10: Projected Sea Level Rise Scenarios



Source: SC Sea grant, NOAA

Referring to the four scenarios presented in figure 2-10, sea levels are likely to rise between 1 and 7 feet in the next century. As coastal communities consider the potential impacts from rising seas, both best and worst case scenarios ought to be considered in the development of strategies for adaptation. NOAA has provided models to visualize the effects of sea level rise which use the "bath tub" modeling technique that applies rising water levels to the topography of coastal areas. These models do not take into account increased storm surge events, coastal erosion, changes in hydrological patterns, or engineering measures undertaken by communities to protect shorelines.

The following maps demonstrate the different levels of sea level rise based on these NOAA models. Abundantly clear in these maps is that even in the lowest sea level rise scenario, Beaufort County experiences a radical shift in the structure of its coastline and wetland areas. At one foot of sea level rise, vast expanses of marshland, a precious commodity for the entire Lowcountry, not only in terms of its ecological but also its cultural value, are completely submerged. With the attraction of the waterfront to housing development, the increased risk to existing homes from higher tides, storm surge and wave action is difficult to predict. While the integration of sea level rise into existing flood models such as SLOSH has yet to become widespread, The American Meteorological Society among others have published research indicating that flooding associated with storm events will become more severe and widespread.

Looking at the overlap between the inundated areas predicted in NOAA's sea level rise models and building footprints supplied by the Beaufort County's GIS department, it is possible to show estimates of the number of buildings that might be affected according to various sea level rise scenarios. Table 2-6 shows the number of buildings contained in the areas identified to be flooded in NOAA's sea level rise model. It is important to note that

these are a rough estimates, rounded to the nearest hundred, and rely exclusively on the topographical data, not accounting for any engineered shoreline protection that may exist in these areas. Furthermore, it is important to note that many structures initially included in counts after one and two feet of sea level rise are non-habitable accessory uses such as boat docks, which is apparent in the maps that show lines of green dots along the edges of waterways.

Table 2-6: Number of Structures Affected in Beaufort County per One Ft. of Sea Level Rise

Sea Level	1ft	2ft	3ft	4ft	5ft	6ft
Structures Affected	2,300	2,600	4,200	8,400	13,700	19,100

Source: NOAA, LCOG

The SC Sea Grant Study addresses flood risk in slightly different terms than how the HMP calculates flood risk based on nationally reported incidents, which typically have significant accompanying damage and are associated with severe weather. The SC Sea Grant study highlights the growing prospect of so called "nuisance flooding" which occurs in tandem with especially high tides. While the HMP analysis of flood risk, and calculation of probability does not take these events into account, they nevertheless impact the lives of area residents in terms of the safety and convenience of transportation networks, use and enjoyment of public and private property, and the impact they have on public infrastructure. While this episodic flooding may not make national headlines, future efforts to track these events will help to illuminate the growing risk of coastal flooding.

During the development of the plan, Beaufort County and surrounding areas experienced a near record high tide which breached seawalls, topped low lying roads, and damaged homes along the coastline. Coastal flooding was experienced in the City of Beaufort, Bluffton, Port Royal, Hilton Head, Fripp Island, and Hunting Island. On October 27th the tide gauge at Ft. Pulaski reported the 3rd highest tide on record dating to 1935, and the highest since the 1940's a decade where two hurricanes produced higher tides. Charleston SC, reported the 3rd highest tide on record with higher tides only being produced by powerful storms such a Hurricane Hugo. The fact that this event was not associated with extreme precipitation contributes to concerns that king tides, and the increasing regularity at which they occur above flood stage, will become an increasing threat to property and life safety in coastal watersheds.

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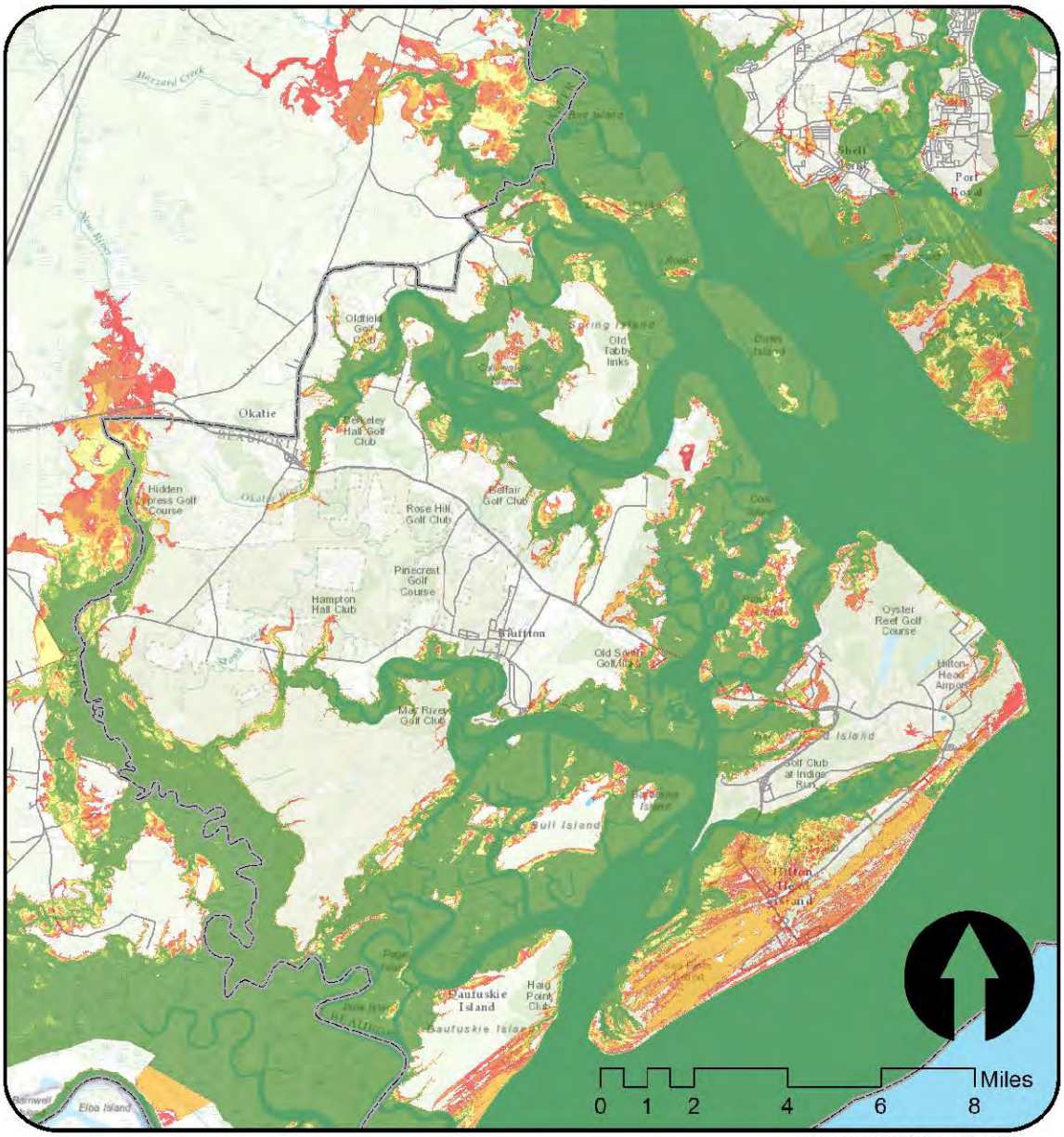
Figure 2-11: Coastal Inundation per One Ft. of Sea Level Rise, Southern Beaufort County



Source: NOAA and ESRI

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 6ft

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Figure 2-12: Affected Structures per One Ft. of Sea Level Rise, Southern Beaufort County

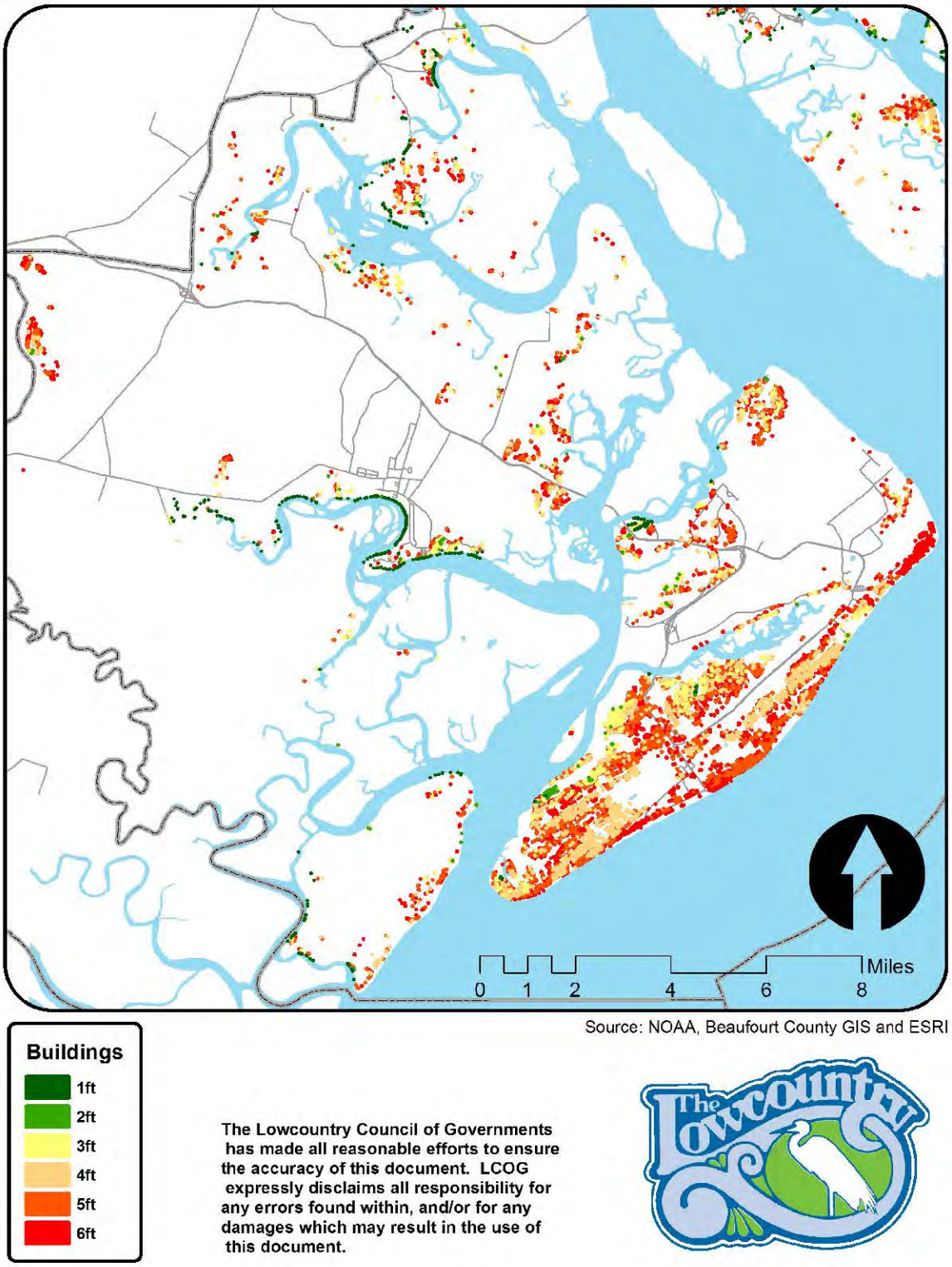
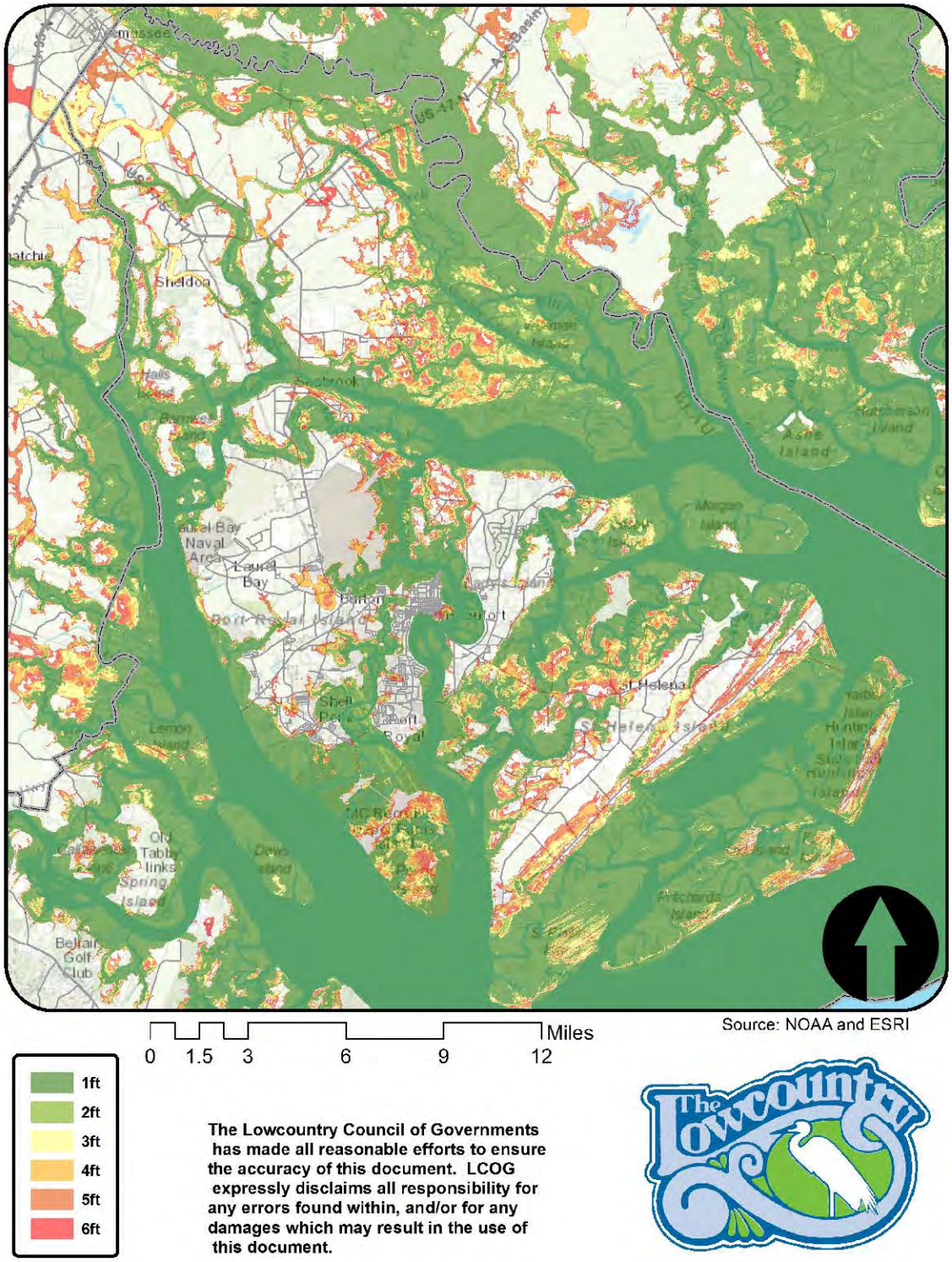


Figure 2-13: Coastal Inundation per One Ft. of Sea Level Rise, Northern Beaufort County



Source: NOAA and ESRI

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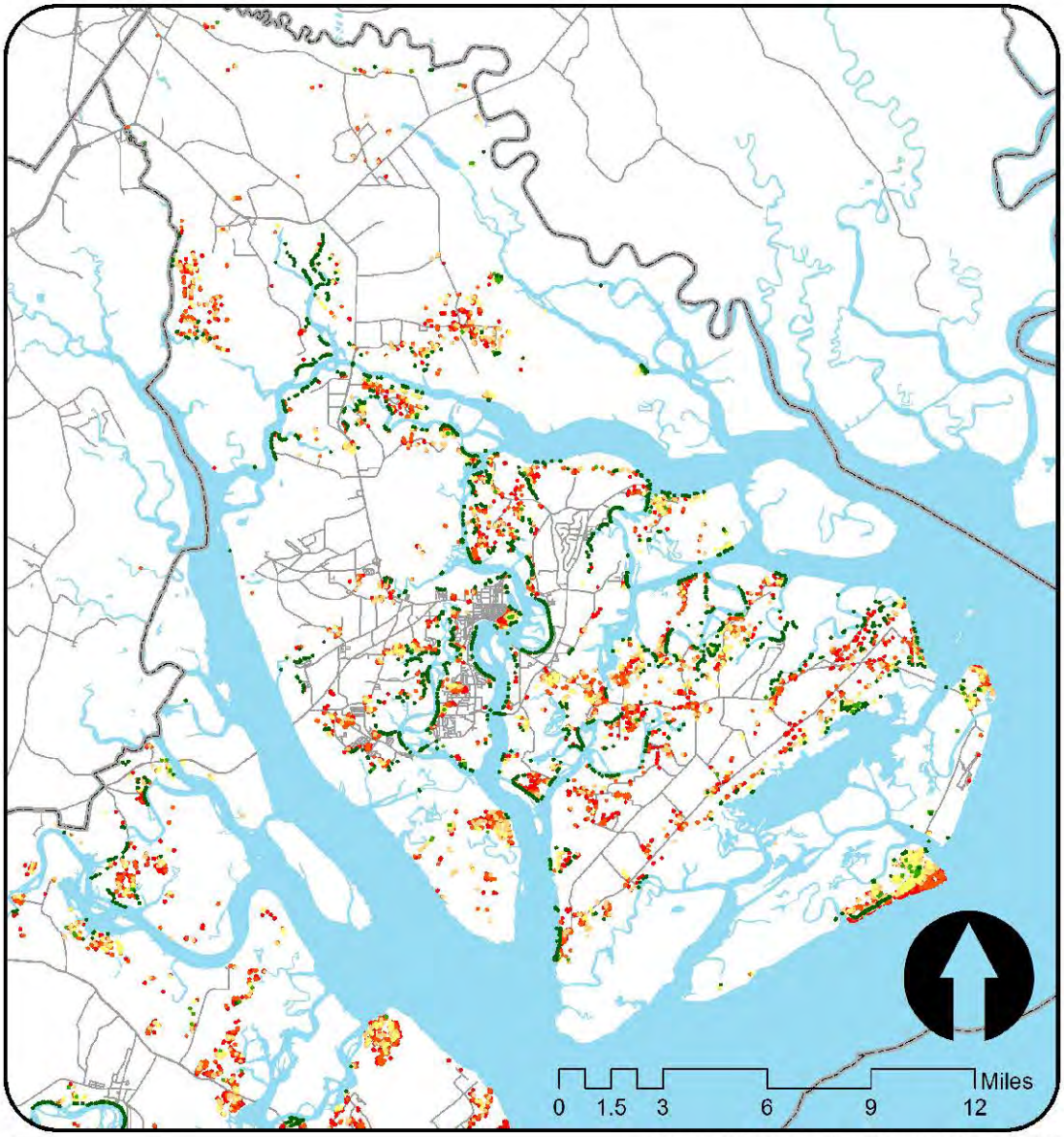
Figure 2-14: Structures Affected per One Ft. of Sea Level Rise, Northern Beaufort County



Source: NOAA, Beaufourt County GIS and ESRI

Buildings
- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 6ft

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Erosion

Erosion and accretion are long term, dynamic processes that occur along shorelines. Major erosion/accretion events are usually associated with coastal storms because floodwater forces have the ability to cause significant acts of erosion/accretion in a short time period.

Erosion is considered a serious hazard in coastal areas because it can threaten coastal development by eroding valuable beach areas including both the flat berm portion and protective dunes of a beach. This has a direct effect on residents and business owners as well as the economies of beach communities that depend on tourists and vacationers.

Past Occurrences and Future Probabilities of Erosion

The South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (DHEC-OCRM) publishes the *Annual State of the Beaches Report* which summarizes changes that have occurred along the state's shoreline. Results of the 2009 report for Beaufort County areas are presented in Table 2-7. Since 2009 was the last year this report was made available, LCOG reviewed the Army Corps of Engineers public notices from 2012 to October 2015 for additional projects. Due to the information gap between 2009 and 2012, this table is not an all-inclusive list of nourishment projects, but is rather based on the best information available. The table notes what, if any, type of shoreline change is occurring for the given area; what the average long-term change rate is; whether or not the area is an unstabilized inlet zone, which is the type of shoreline zone where the greatest amount of change is likely to occur; and the date of the last nourishment project in the area.

Hunting Island State Park had previously been listed as the state's highest priority for beach nourishment/restoration in the "State of the Beaches Report." Hunting Island provides public access to the beach, is the most visited state park in South Carolina and regularly attracts at least 1,000,000 visitors a year. but experiences chronic erosion. Nourishment is conducted on the island as it is needed and as funding can be provided.

While it is difficult to obtain a precise hazard frequency of beach erosion, it is definite that the hazard occurs frequently in Beaufort County and that mitigation actions should be undertaken to slow its progress.

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Table 2-7: Erosion and Beach Nourishment in Beaufort County

Area	Erosion, Accretion, or Stable	Average Annual Long-Term Change Rate (feet)	Unstabilized Inlet Zone?	Date of Last Nourishment Project
DAUFUSKIE ISLAND	Erosion	4 to 5	Yes	2015
FRIPP ISLAND				
Central to Northern island along Atlantic Coast	Strongly accretional	2-5 ft	No	
Southern island and NE island along Atlantic	Erosion	----------	No	
Fripp Inlet coastline	Erosion	----------	No	
HARBOR ISLAND			No	
Southern Island	Accretion		Yes	
Northern portions	Erosion		Yes	2015
HILTON HEAD ISLAND				
Sea Pines Plantation along Calibogue Sound	Light Accretion		Yes	Winter 1999
South Forest Beach	Stable	----------	No	2014
North Forest Beaches and Palmetto Dunes	Erosion	----------	No	2014
Folly Beach-2200 ft stretch	Erosion	6	Yes	2014
1.3 mile stretch beginning just north of Burke's Beach Road	Stable	----------	No	
Port Royal Plantation shoreline – Atlantic Coast	Accretion	----------	Yes	2014
Port Royal Plantation shoreline – Port Royal Sound	Erosion	2 to 5	Yes	2014
HUNTING ISLAND				
Southern End	Strongly erosional	7 to 15	Yes	2006
Northern End	Strongly erosional	7 to 15	No –inlet zone stabilized by terminal groin	2006
PRITCHARD ISLAND	Highly erosional with accretion in some areas including north end	----------	----------	----------

Source: OCRM, Army Corps of Engineers

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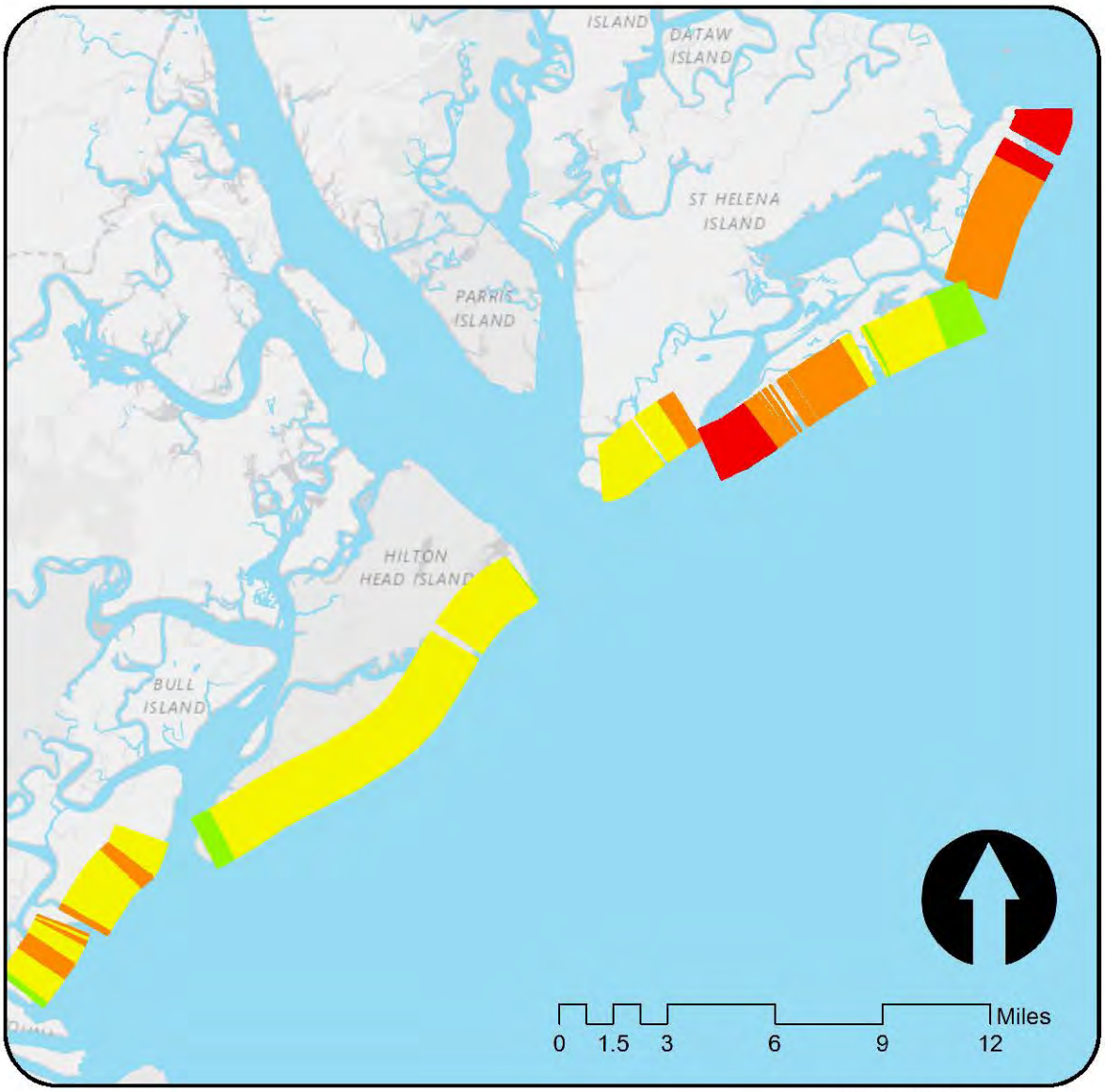
Figure 2-15: Rates of Erosion and Accretion in Beaufort County



Source: USGS and ESRI

Erosion/Accretion Rate
Meters/Year

- -13 - -5
- -5 - -2
- -2 - 2
- 2 - 5
- Greater than 5

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Winter Storms

Winter storms can be very disruptive, particularly in areas where they are not frequent occurrences. While winter storms have had an effect on South Carolina and Beaufort County, they occur relatively infrequently compared to areas of the northern U.S.

Winter storms can combine different types of precipitation including snowfall and ice storms, as well as high winds, and cold temperatures. According to SC Hazard Research Lab assessment, there is a 1.5 percent chance in any given winter of a cumulative snow depth total of up to approximately 10 inches of snow in Beaufort County. The area is thus expected to experience this type of winter on average once every 65 years.

Past Occurrences of Winter Storms

Significant winter storms occur occasionally in the State of South Carolina.

A snow storm that occurred from February 10-11, 1973 in South Carolina resulted in Beaufort receiving 11 inches of snow. The storm caused about 30,000 tourists to be stranded on the State's highways; many of them had to be rescued by helicopter. The storm also brought severe winds and cold weather. Damage estimates reports indicated that at least 200 buildings collapsed. The damage estimate for property, and road damage as well as the cost of snow removal and rescue operations was approximately $30 million (1973 dollars).

A winter storm event in 1989 caused snow accumulation in Beaufort County. While the highest snow depths in the state, about 14-15 inches, were recorded near Myrtle Beach, Beaufort County received approximately 5 inches of snow.

The March 1993 northeaster was a winter storm event that caused damage and the loss of life in South Carolina. While there was no snow accumulation reported in Beaufort County, there were reports of high winds along the coastlines of the southeastern states leading to some property damage.

On January 24, 2000, 1-2 inches of snow was measured in Beaufort County and was the first measurable event since 1989. Areas along the coast experienced mixtures of small amounts of sleet and freezing rain with the snow. The northwest portion of the state was particularly hard hit and received up to 6 inches of snow. This had a significant impact on major highways in including Interstate 85 where numerous accidents were reported. Tens of thousands of people in the state lost power due to power lines downed by the ice and snow.

Beaufort County had a near miss with an event that occurred in early December 2002. A winter snow storm resulted in a Presidentially-declared disaster in 6 counties in northwest South Carolina including Cherokee, Greenville, Laurens, Spartanburg, Union and York Counties. As a result of this storm, tens of thousands in the Greenville area lost power.

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On January 4, 2002 an ice storm occurred that affected northern Beaufort County. Weather stations reported some freezing drizzle and light snowfall. In Yemassee, residents were without power for several days.

A February 2014 storm front produced freezing rain and snow throughout the Lowcountry, with ice accretion at 1/4 inch to 1/2 inch. While this storm did not have a major impact on Beaufort County, Colleton and Hampton Counties were particularly affected. One fatality was attributed to the winter storm and power was out in significant portions of the region for days due to the many downed trees. Roadways were impassible, hundreds of businesses closed, and thousands of children stayed home from school. Tremendous amounts of debris generated by the storm required the cooperation of Lowcountry governments to restore transportation networks and utilities. The entire state was declared a state of emergency and the U.S. Federal Government declared a major natural disaster. Shelters were activated. During the event the middle school shelter in Colleton County experienced power loss and difficulties with generators.

The overall cost of the storm was considerable. Statewide, the timber industry alone, confirmed $360 million trees lost or damaged. SCE&G officials noted that the damage from the storm to their utilities infrastructure was worse than the effects of Hurricane Hugo.

Future Probabilities of Winter Storms

Based on the limited period of record for winter events, 5 major winter storm events have occurred within South Carolina in the last 20 years. However, only one of these resulted in winter precipitation and had a moderate to major impact on Beaufort County. The recording period is 65 years; therefore, the estimate for the county's winter storm probability is 1.5 percent.

Drought

Drought is caused by lack of precipitation, but can be heightened or worsened by other circumstances such as high temperatures, high winds, and low relative humidity. Droughts can result in a shortage of water for consumption and can affect hydroelectric power, recreation, and navigation. Additionally, severe droughts can lead to losses of crops, wildlife and livestock, as well as wildfires.

Future Probability of Drought

According to the Hazard Research Lab (SCHRL), 21 droughts have occurred in Beaufort County in the last 65 years. This represents an annual probability of 32.81 percent. Data from the South Carolina Department of Natural Resources' Drought Response Program, in addition to data from the National Drought Mitigation Center, shows how much time Beaufort County has been subject to various drought conditions as defined by the Palmer Drought Severity Index for a period of record of about 90 years (1080 months) beginning in 1925 and ending in 2015. For about 35 percent of the period of record, the area was subject

to mild drought conditions. The area was subject to moderate to severe conditions for a total of 23 percent of the period of record. Four percent of this time fell under extreme drought conditions. According to the State Climatology Office, since the adoption of the last HMP, Beaufort County has experienced two periods of drought: one moderate drought from the summer of 2011 through spring of 2012 and another during late winter of 2013.

Table 2-8: Time Spent in Drought Conditions 1925-2015

Drought Condition	Approximate Percentage of Time
Mild	35.2
Moderate	15.4
Severe	8.2
Extreme	5.4

Source: SCNDR, NDMC

Extreme Heat

Worldwide, 2014 was the hottest year on record and 2015 is on course to be hotter. Locally, temperatures are expected to increase this century. NOAA has projected the number of 95 degrees or hotter days, to increase by more than 20 days between the years 2041- 2070.

Heat kills by taxing the human body beyond its abilities. In an average year, about 175 Americans succumb to the effects of summer heat. People with heart or pulmonary conditions are particularly vulnerable in this regard. Among the large continental family of natural hazards, only the cold of winter, not lightning, hurricanes, tornadoes, floods, or earthquakes, takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation (NCDC). High humidity reduces the body's ability to cool, causing the perception of even higher temperatures.

Beaufort County, during summer months, regularly experiences high temperatures in the mid-nineties, and it is not uncommon for temperatures to reach above 100 degrees. However, in comparison to more inland areas, the cooling effect of the vast expanses of surface water across the County does provide some relief The following map indicates an average monthly high temperature for the month of July from 1981 to 2010.

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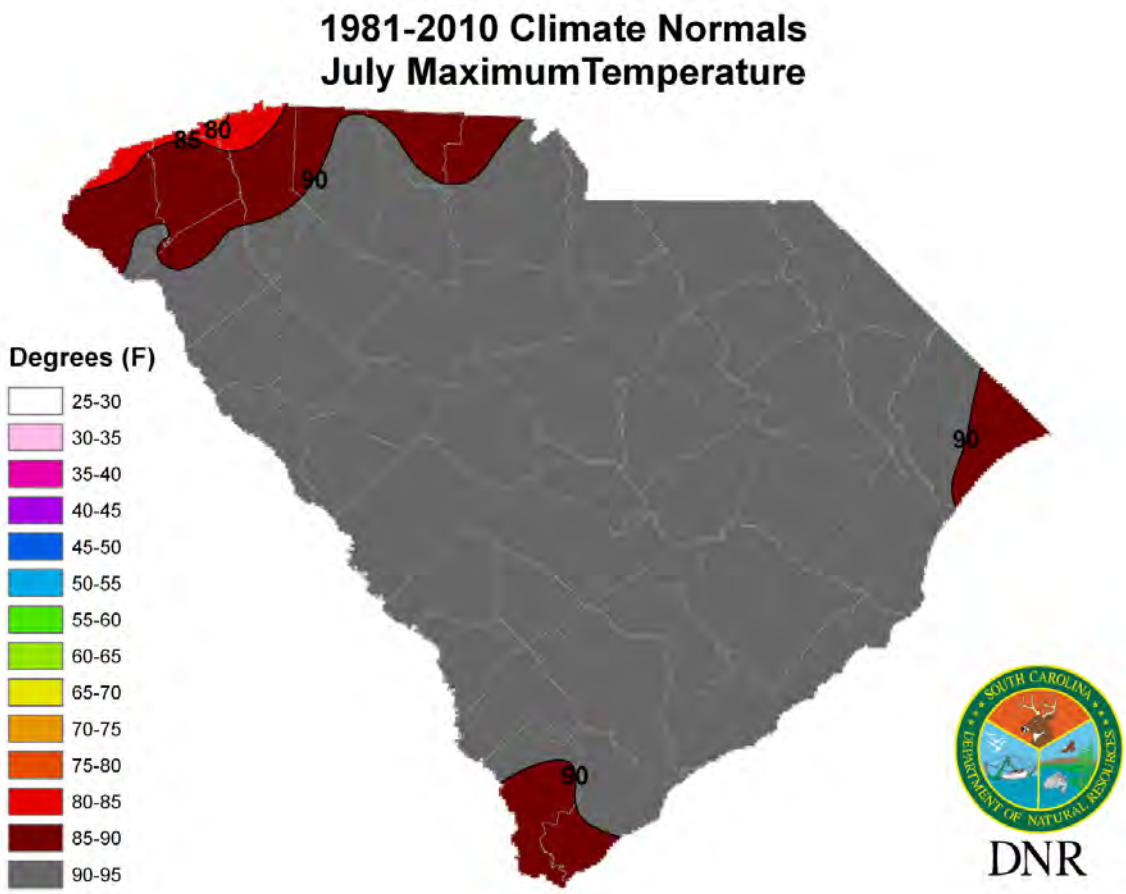
Figure 2-16: Average High Temperature for July in South Carolina



Source: SCDNR

Extreme Heat, often associated with a period of drought, has a high potential to cause agricultural losses (including livestock), and wild fires are much more likely to occur. High heat conditions can damage roadways and lead to electrical brownouts. The hydrologic impacts of the heat wave and drought include exceptionally low water levels in many streams and rivers. According to the NCDC, from 2010 to 2015 there have been 6 days of excessive heat, reported in July of 2010 and July and August 2011.

Wind: Thunderstorms, Hail, and Tornadoes

Beaufort County's coastal location lends itself to being vulnerable to hurricanes and brings not only the threat of flooding, but also damage from wind. Figure 6-1 of The American Society of Civil Engineers (ASCE) publication, *Minimum Design Loads for Buildings and Structures*, 1998 (also referred to as ASCE 7-98) shows that for Beaufort County the design wind speed (3-second gust) for structures ranges from 130 mph along the coast to 110 mph at the County's furthest inland point. While most of the continental U.S. is mapped as having a design wind speed of 90 mph, the Atlantic and Gulf Coast areas have design wind speeds ranging from 100 mph to 150 mph (along the tip of the Florida peninsula and a portion of the Gulf Coast).

FEMA's publication, *Taking Shelter from the Storm*, 2008, presents a map of four wind zones in the U.S. and provides design wind speeds for shelters and other critical facilities. Zone IV shows the areas of highest wind activity which are situated in the Midwest and Tornado Alley, while Zone I shows the areas of lowest activity which are in the western U.S. All of South Carolina is mapped in Zone III. For shelters in this zone, a design wind speed of 200 mph is recommended.

Past Occurrences of Thunderstorms

Wind events can also be the result of thunderstorms, which occur more often than hurricanes. Historical records from the NCDC shows that there have been 185 wind events in Beaufort County since 1950 related to thunderstorms. For 144 of these storms, wind speeds 50 kts or greater were recorded. According to the NCDC, from 2010 to 2015 there have been 60 reported thunderstorm events in Beaufort County.

Future Probability of Thunderstorms

Based on these records, thunderstorms are predicted to occur in Beaufort County at a high rate**.** For the 65 years of record, the 185 storms represent an annual probability of 100 percent. Beaufort experiences multiple thunderstorms annually, and this hazard is one that merits serious attention.

Hail

Hail are frozen droplets of water that thaw and freeze while wind patterns (updrafts and downdrafts) take them between colder and warmer elevations within a thunderstorm cloud. Each time the droplet re-freezes, another layer of ice is added to the object, thus making it larger until it falls to the earth. Since 1970, the NCDC reports 61 incidents of hail in Beaufort County, putting the probability of future hailstorms at 100% annually. In an average year, hail causes one billion dollars in crop and property damage nationwide (NOAA). Since the completion of the last plan update, Beaufort County has experienced several severe hail events, one example being the hail measuring 2.5 inches which fell on the 27th of March, 2011. According to the NCDC, from 2010 to 2015 there have been 9 reported hail events.

Tornadoes

The National Weather Service defines a tornado as a violently rotating column of air pendant from a thunderstorm cloud that touches the ground. Tornadoes are generally considered the most destructive of all atmospheric-generated phenomena, with an average of 800 touching down annually in the United States. In the U.S., May and June are the most active months for tornadoes. Thirty percent of tornado activity occurs between the hours of 3:00 pm and 6:00 pm, and an additional estimated 25 percent occurs between 6:00 pm and 9:00 pm.

Tornadoes are classified using the tornado scale developed by Dr. Theodore Fujita. The Enhanced Fujita Scale went into effect in 2007, replacing the original. The Fujita Tornado Scale assigns a category to tornadoes based on their wind speed and relates this to the general

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type of damage that is expected. Ratings range from EF0 (light damage), to F5 (total destruction of a building). The scale is presented in Table 2-9. Approximately 90 percent of tornadoes nationwide recorded between 1956 and 2001 have been F2, F1, and F0 tornadoes. Nearly 88 percent of these have been F1 and F0 tornadoes.

Table 2-9: Enhanced Fujita Tornado Scale

Scale Value	Wind Speed Range (mph)	Type of Damage
EF0	65-85	Light – May be some damage to poorly maintained roofs. Unsecured lightweight objects, such as trash cans, are displaced.
EF1	86-109	Moderate – Minor damage to roofs occurs, and windows are broken. Larger heavier objects become displaced. Minor damage to trees and landscaping can be observed.
EF2	110-137	Considerable – Roofs are damaged. Manufactured homes, on nonpermanent foundations, can be shifted off their foundations. Trees and landscaping either snap or are blown over. Medium-sized debris becomes airborne, damaging other structures.
EF3	138-167	Severe – Roofs and some walls, especially unreinforced masonry, are torn from structures. Small ancillary buildings are often destroyed. Manufactured homes on nonpermanent foundations can be overturned. Some trees are uprooted.
EF4	168-199	Devastating - Well constructed homes, as well as manufactured homes, are destroyed. Some structures are lifted off their foundations. Automobile-sized debris is displaced and often tumbles. Trees are often uprooted and blow over.
EF5	200-234	Incredible – Strong frame houses and engineered buildings are lifted from their foundations or are significantly damaged or destroyed. Automobile-sized debris is moved significant distances. Trees are uprooted and splintered.

Source: NOAA

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Past Occurrences of Tornadoes

Scale specific intervals are reported below. However, some of the touchdown locations are recorded for the same date and are therefore either the same tornado or the same system moving through (there are 18 separate tornado days). Most of the recorded incidents of tornadoes in Beaufort County have been low strength tornadoes; only one tornado with a rating of F2 has been recorded. The other incidents were all F0 or F1 tornadoes. Some of the touchdown locations are recorded for the same date very close in time to one another. They are likely the same tornado or the same system moving through. Following the general trend of tornado touchdowns, many of the 25 recorded tornadoes occurred in June. Table 2-8 presents a list of the recorded tornado activity in Beaufort County and includes incidents of

sighted funnel clouds and waterspouts. Damage estimates are given as costs from the time when they occurred, if available.

Table 2-10. History of Known Tornadoes in Beaufort County, 1950 – 2014

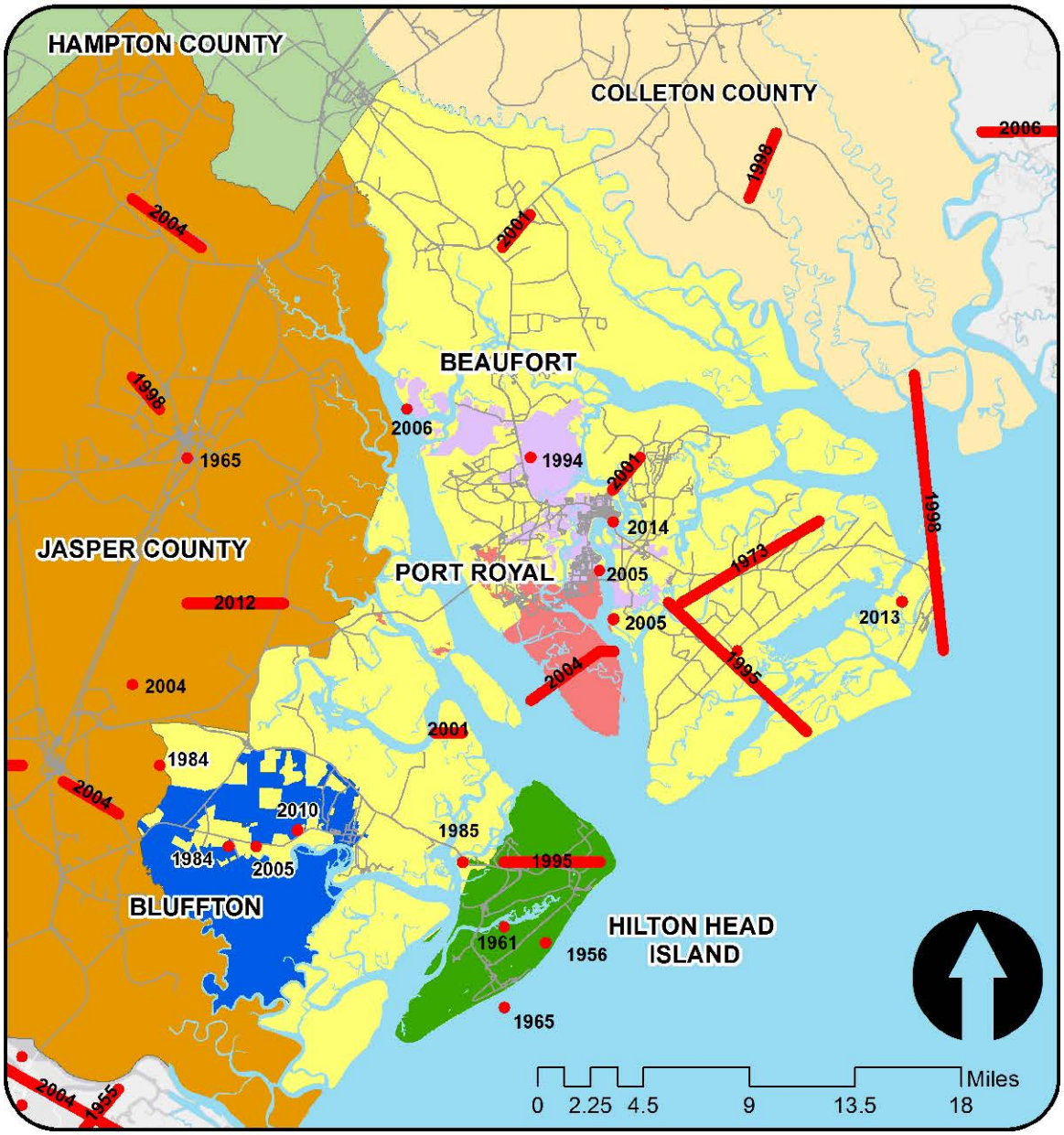
LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
BEAUFORT CO.	9/25/1956	F0	0	0	$250
BEAUFORT CO.	4/12/1961	F0	0	0	$25,000
BEAUFORT CO.	10/7/1965	F1	0	0	$250,000
BEAUFORT CO.	10/7/1965	F1	0	0	$25,000
BEAUFORT CO.	5/29/1973	F1	0	0	$25,000
BEAUFORT CO.	5/3/1984	F1	0	0	$25,000
BEAUFORT CO.	6/16/1985	F0	0	0	$0
BEAUFORT CO.	6/30/1994	F0	0	0	$0
Hilton Head Island	6/5/1995	F1	0	0	$500,000
St. Helena Island	6/12/1995	F1	0	1	$60,000
FROGMORE	9/3/1998	F2	1	4	$360,000
GARDENS CORNER	6/12/2001	F0	0	0	$0
BLUFFTON	6/12/2001	F0	0	0	$0
PARRIS IS	6/12/2001	F0	0	0	$0
BEAUFORT	6/12/2001	F0	0	0	$0
PARRIS IS	6/15/2004	F0	0	0	$0
HILTON HEAD IS	9/6/2004	F1	0	0	$0
PARRIS IS	7/13/2005	F0	0	0	$0
BEAUFORT	7/13/2005	F0	0	0	$0
BLUFFTON	7/13/2005	F0	0	0	$0
LAUREL BAY	6/13/2006	F0	0	0	$0
BLUFFTON	4/8/2010	F0	0	0	$40,000
FROGMORE	7/13/2013	F0	0	0	$0
BEAUFORT	6/23/2014	F0	0	0	$0

Source: NCDC

County emergency management and local community staff recalled that there was significant damage associated with the June 5, 1995 tornado because the tornado hit a fairly densely developed area and caused damage to a grocery store and a nearby construction project/site. The June 12, 1995 tornado also hit a fairly densely developed area causing damage to several residential structures. Finally, in September 1998, a Frogmore resident was killed when a tornado struck his mobile home. The surrounding small mobile home community was damaged by the storm, and the road was blocked by fallen trees. Since assistance from the state and federal governments was not going to be available, the construction squadron from MCAS Beaufort volunteered their labor and heavy equipment over the Labor Day weekend to clear the area and remove debris.

Figure 2-18 shows the known locations of the tornado touchdowns within Beaufort County for which data is available.

Figure 2-17: Tornado Events in or near Beaufort County, 1950-2014



Source: NOAA and ESRI

- Tornado
- Beaufort
- Bluffton
- Hilton Head Island
- Port Royal

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Future Probabilities of Tornadoes

In order to estimate the frequency of occurrence, the number of tornado days (not actual tornado incidents since tornadoes that occurred close in time on the same day are likely the same tornado that has re-formed, or a tornado that is part of the same system) is compared to the length of the period of record which is from 1950 to 2015. The recurrence interval is defined from this information and is a rough estimate of the amount of time, *on average*, during which one occurrence of a given category of tornado will take place. It is important to note that in reality, a tornado can occur multiple times during one recurrence interval, and that the recurrence interval is only an estimated average time period. Recurrence intervals for tornadoes within Beaufort County are presented in Table 2-11. This data is based on information reported directly from the NCDC. The probability of a tornado occurring in Beaufort County in any given year is 27.69 percent.

Table 2-11. Estimated Recurrence Intervals of Tornadoes (based on data from 1950 to 2015)

Tornado Class	Number of Occurrences Within Beaufort County (Tornado Days)	Recurrence Interval (Years)
F0	11	5.9
F1	6	9.2
F2	1	65.0
F3	no record	----------
F4	no record	----------
F5	no record	----------
All Tornado Events	18	3.61

Source: NCDC

There is a moderate rate of occurrence of tornadoes in Beaufort County, and this has slightly increased since the original hazard mitigation plan, but they are generally not considered as significant of a hazard as flooding and wind associated with storms and hurricanes. Wind hazard mitigation will be addressed in the goals and actions section of this plan, as high wind speed is the most harmful effect of a tornado.

Earthquakes

Earthquakes are classified according to their magnitude. The magnitude is a measurement of the maximum motion caused by an earthquake and is recorded by a seismograph. While several scales have been defined, the most commonly used is the magnitude local (ML)

which is used by the Richter Scale. Table 2-12 presents a classification of earthquakes according to their Richter Scale magnitude.

The USGS rates areas of the United States for their susceptibility to earthquakes based on a 10 percent probability of a given peak force, being exceeded in a 50 year period. Beaufort County's peak acceleration is 5-6% g which is considered significant.

Table 2-12. Richter Scale Magnitude Classes

MAGNITUDE CLASS	MAGNITUDE RANGE ML = MAGNITUDE
Great	ML ≥ 8
Major	7 ≤ ML < 7.9
Strong	6 ≤ ML < 6.9
Moderate	5 ≤ ML < 5.9
Light	4 ≤ ML < 4.9
Minor	3 ≤ ML < 3.9
Micro	ML<3

Past Occurrences of Earthquakes

Earthquake epicenter location data (gathered by the HRL from the University of South Carolina Seismic Network), was collected for the period from 1698 to 2008 and indicates that there has only been one earthquake with its epicenter in Beaufort County. The Beaufort County earthquake had an epicenter located on Hilton Head Island and occurred on January 4, 1989. Its magnitude measured 2.8 on the Richter scale. Earthquakes with magnitudes less than 3.0 are considered micro-earthquakes, and those with magnitudes less than 2.5 are generally not felt by humans. Earthquakes that measure magnitudes of at least 5.0 on the Richter scale are considered moderate, and those above 5.9 are classified as strong, major or great.

Earthquakes near Beaufort County: potentially a major impact.

Although only one epicenter is located within the County for the period of record, there are areas of more intense earthquake activity located near Beaufort County. One area of more intense seismic activity is in Berkeley, Colleton, Charleston and Dorchester Counties. In this area, approximately 732 earthquakes occurred over the period of record (1698- 2008). The average magnitude of the earthquakes was a low 2.4 on the Richter scale. However, the highest magnitude recorded was 6.90 in 1886. Of the 732 earthquakes, four earthquakes measured magnitudes above 5.0, and 11 measured magnitudes greater than or equal to 4.0.

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1886 Earthquake

The Charleston Earthquake of 1886 was the largest earthquake of record for the southeastern United States, and one of the largest earthquakes in eastern North America. Its major shock, which lasted less than one minute, had a magnitude of 6.9, and occurred on August 31, 1886. It resulted in serious damage to the City of Charleston, and a death toll of approximately 60 people. The areas of most significant damage were Charleston and areas directly northwest of the city including Summerville and Jedburg.

In addition to the recorded events for the period of record, research has shown that there have likely been several events, of strong to major magnitude along the South Carolina Coastal Plain (Talwani and Schaeffer) over the last 6,000 years. Some of these events, along with the 1886 earthquake have caused seismically induced liquefaction which has been observed at several sites in Coastal South Carolina, including the Bluffton area. According to Talwani and Schaeffer, one possible scenario puts one of the seismic events epicenters' near Bluffton with a magnitude of about 6.0. However, the study suggests that earthquakes with epicenters near Charleston are much more likely and that major earthquakes at Charleston have a recurrence interval of about 500-600 years. Because of the proximity to fault lines near Charleston and Bluffton, Beaufort County has a strong commitment to seismic safety.

Future Probabilities of Earthquakes

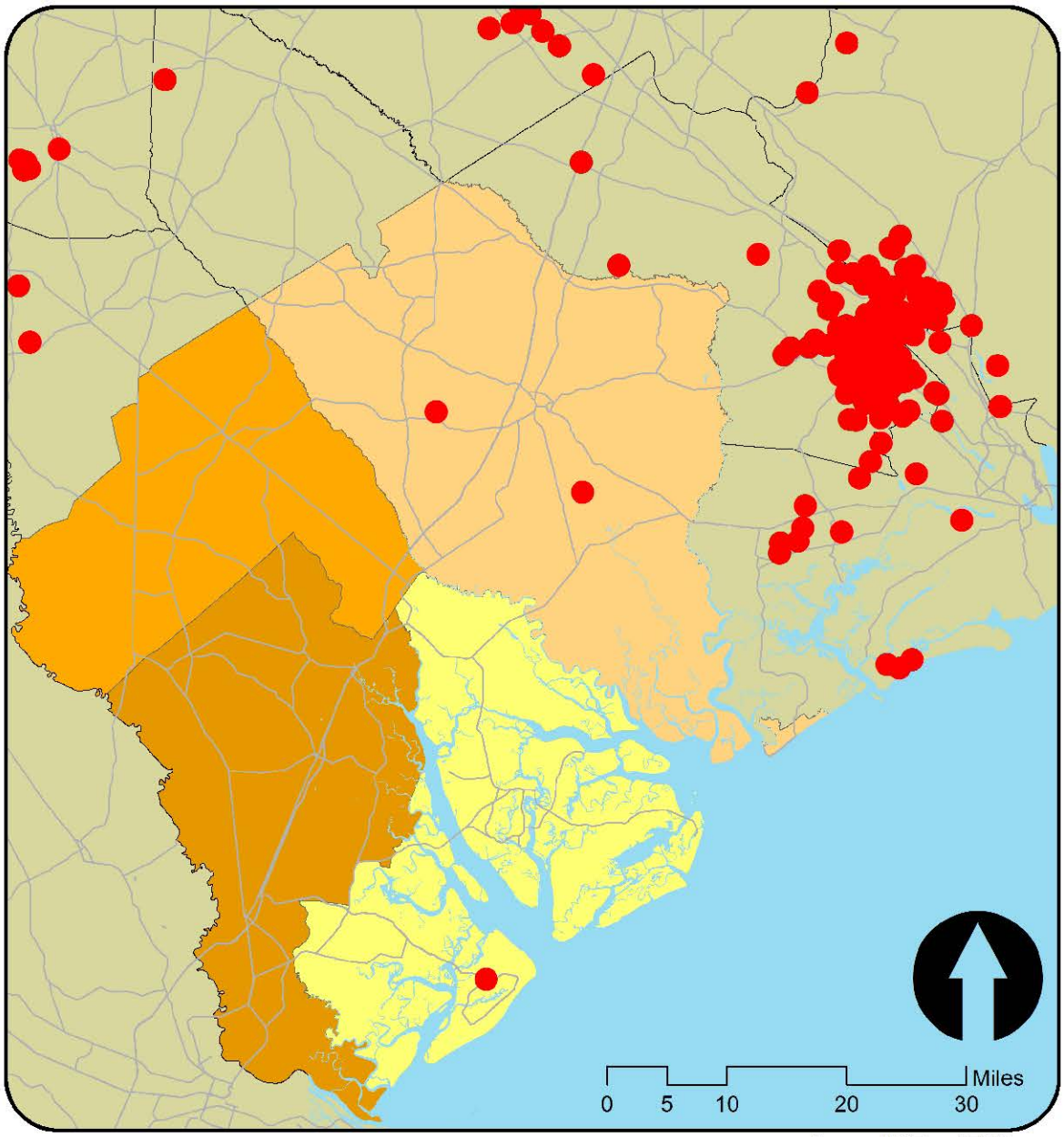
Looking at the occurrences of earthquakes from 1698-2008, the following recurrence intervals for earthquake events were determined (Table 2-13). These figures are based only on seismic activity with magnitudes of 3 or more and therefore include 132 events with epicenters in the previously described locations in Beaufort, Berkeley, Colleton, Charleston and Dorchester Counties. While the SCHRL reports only a .32 percent annual probability of a strong earthquake in the region, the effects of such an event on Beaufort County could be devastating, especially considering its proximity to major fault lines. Therefore, earthquakes are a considered a major hazard to be taken seriously.

Table 2-13. Estimated Recurrence Intervals of Earthquakes in Beaufort, Berkeley, Colleton, Charleston and Dorchester Counties

MAGNITUDE CLASS	NUMBER OF OCCURRENCES	RECURRENCE INTERVAL (YEARS)
Great	0	------
Major	0	------
Strong	1	311
Moderate	3	103.7
Light	7	44.4
Minor	136	2.3

Source: SCHRL

Figure 2-18: Historical Epicenter Locations 1698-2015



Source: IHAT and ESRI

Earthquakes
Beaufort County
Colleton County
Hampton County
Jasper County

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Fire

According to the U.S. Forest Service's Wildland Fire Assessment System (http://www.wfas.net/), Beaufort County is located in a low-risk fire danger area. Generally, there are three major factors to consider in assessing the threat of wildfires to a community: topography, vegetation and weather.

An area's terrain and land slopes affect its susceptibility to wildfire spread. Wildfire travels much faster upslope than it does down slope. Wildfire can spread rapidly on steep slopes; where the ground slope doubles, the rate of wildfire spread upslope will be likely to double. Beaufort County is situated on the coastal plain and is very flat; the County's highest ground elevation is approximately 50 ft NGVD 29.

Vegetation and land use is another characteristic that affects the spread of wildfire. In particular, forests/dense wooded areas and grasslands provide readily accessible fuel for wildfires. Besides just the existence of this type of vegetation, its moisture content is also a significant factor. This is dependent on weather; droughts or dry weather cause vegetation to become dryer and thus serve as better fuel. While there are sizeable marsh areas in Beaufort County, there are also numerous undeveloped forested areas and grasslands that can be susceptible to wildfires during dry conditions.

Weather is the third factor for consideration. High temperatures combined with low humidity offer the most conducive environment for wildfires. Beaufort County's climate is considered Subtropical Humid. While the County may experience high temperatures during the summer months, this is usually combined with high levels of humidity which are not conducive to the ignition and spread of wildfires. However, during periods of drought, the threat of wildfire increases.

Past Occurrences of Fire

Records for wildfire events were obtained from the South Carolina Forestry Commission (SCFC). The SCFC responds to fires occurring in forested areas or brush areas and terms these types of fires landfires. The number of annual landfire events for Beaufort County for the period of record from 1946-2015 was provided by the SCFC.

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Figure 2-19: Beaufort County Wildfires 1998-2010

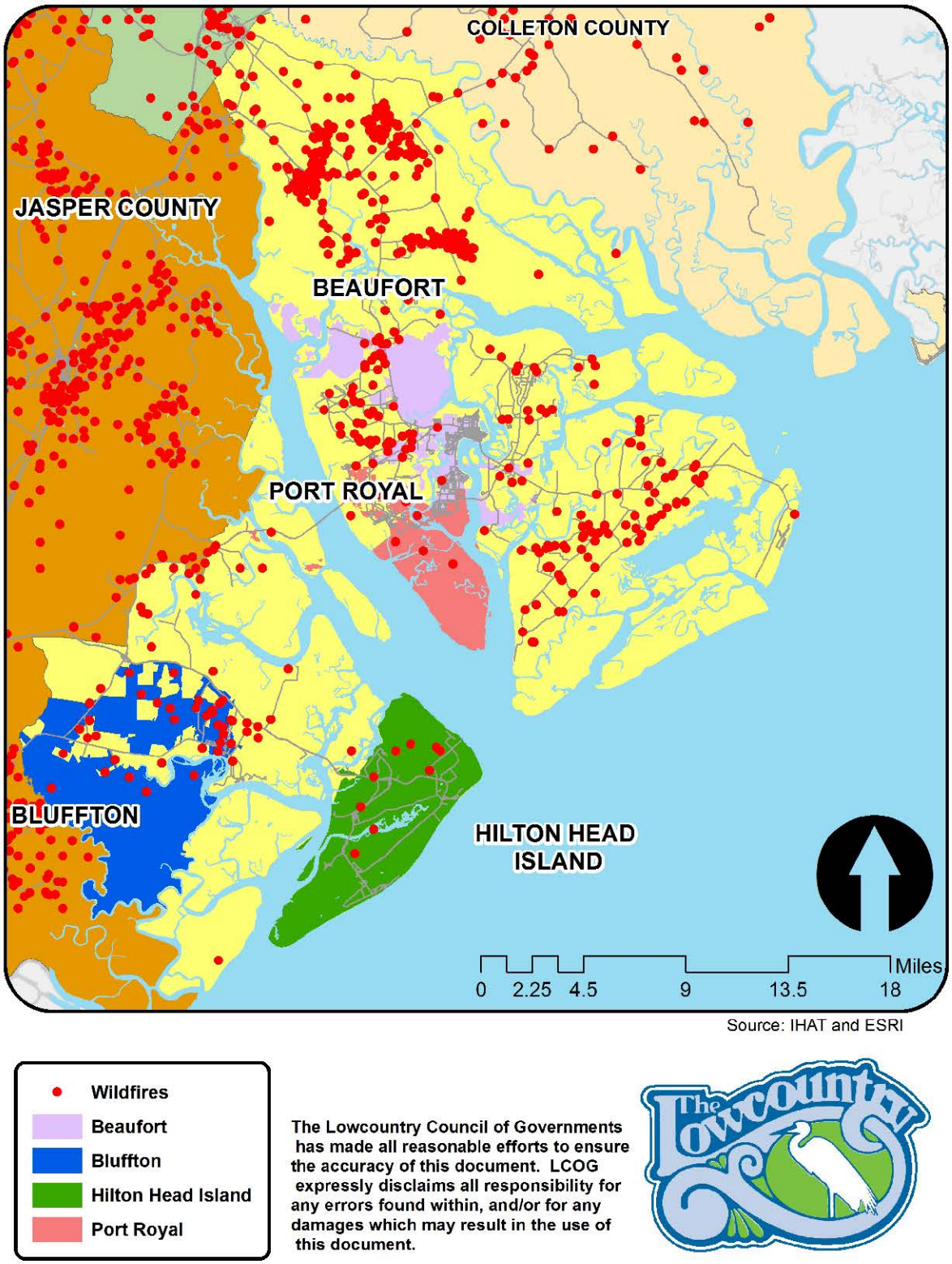
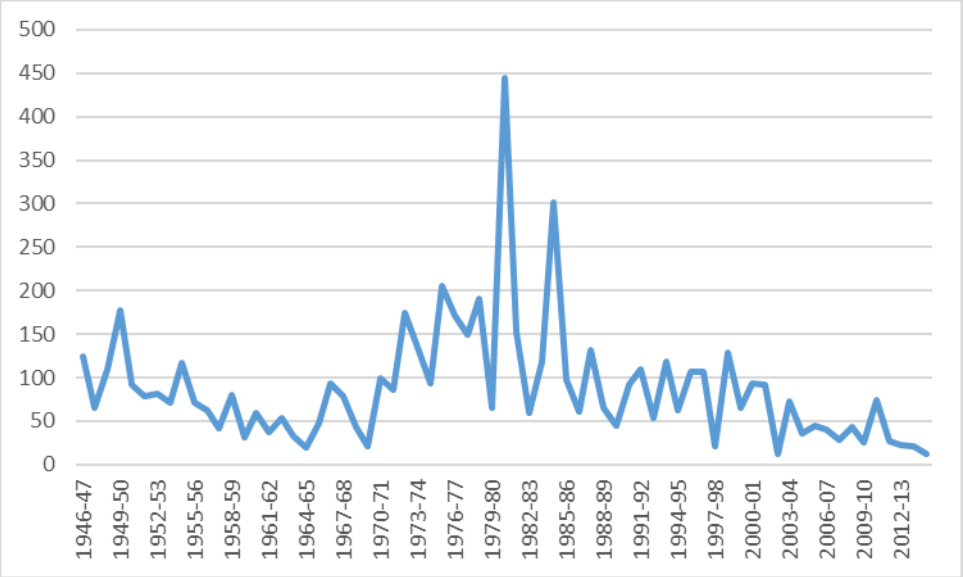


Figure 2-20: Occurrences of Landfires in Beaufort County, 1946-2015



Source: South Carolina Forestry Commission

According to the Beaufort County Forest Ranger, typical wildfires occur in forested areas of the County and in areas known as broomstraw fields where there is ample fuel for fires in the form of tall grass. Typically, these fires do not cause damage to structures, but affect only uninhabited areas. The SCFC has records of the damage caused by each individual fire event, but it has not been compiled electronically or on an annual basis.

According to Beaufort County Emergency Management officials, these fires are generally started by people through careless actions such as improper disposal of lit cigarettes or charcoal type fuel for outdoor cooking, and starting outdoor camp fires that are not properly controlled.

The SC Forestry Commission reports an average of 396 acres of land are burned per year in Beaufort County. Given the relatively small land areas affected by the fires and the terrain of Beaufort County, wildfires are considered a minor to moderate threat for the unincorporated and incorporated areas of Beaufort County. Furthermore, the potential for loss from wildfires (less than one percent of Beaufort's total potential loss) means this is considered a relatively low risk hazard, yet will be addressed by a mitigation action.

Future Probabilities of Fire

Based on fire event data from the past 21 years, The SC Hazards Lab reports an average of 72 wildfires occur annually in Beaufort County. The annual probability for fire in Beaufort County is 100 percent per year. However, looking at past occurrences as an indicator, it is likely that less than one square mile of land on average will be affected annually by wildfires.

Hazards not Historically Prevalent

Dam Failure

According to GIS data and previous HAZUS data collection, there are 15 dams within Beaufort County. Most of these dams are less than 10 feet in height and all are under 25 feet in height. Dams less than 25 feet in height are generally exempt from the Dams and Reservoirs Safety Act because, in most cases, their failure would not pose a serious threat to life, safety, or property. The Relative Hazard Rating for all of the dams in Beaufort County is low (previous HAZUS assessment).

Data for neighboring counties of Colleton, Jasper and Hampton shows that there are 39 dams within those counties, 38 of which also have a low relative hazard rating. There is one dam within Hampton County classified as having a significant hazard rating. This dam has an emergency action plan, and is located along Black Creek, a tributary of the Coosawhatchie River which flows to the tidally-influenced Broad River. Although the dam is located in the drainage basin of the Broad River, it is located approximately 35 stream miles above Beaufort County. The dam reservoir has a drainage area of approximately 60 square miles, but given the dam's distance from Beaufort County and the fact that the Coosawhatchie and Broad Rivers' drainage areas are relatively high, a dam failure at the Hampton County dam is not likely to have a significant impact on Beaufort County. The SC Hazard Research Lab has no record of dam failure for Beaufort County. Therefore, dam failure is not considered a significant hazard within Beaufort County.

Landslides

Landslides are often prompted by the occurrence of other disasters. Floods or long duration precipitation events create saturated, unstable soils that are more susceptible to failure. The forces of earthquakes can also cause landslides. In the eastern U.S., landslides are common in the Appalachian region and New England; in this portion of the country, clay-rich soils are a concern and are considered more susceptible to landslides.

The USGS has a National Landslide Hazards Program and has mapped the landslide risk for the entire conterminous U.S. All of eastern South Carolina is mapped in the lowest risk zone where there is a low landslide incidence that involves less than 1.5 percent of the land area. Given the relatively flat relief of Beaufort County, and its low landslide incidence as mapped by the USGS, landslides are not considered a significant threat within the County. According the SCHRL, there are no recorded occurrences of landslides in the County.

Tsunamis

Tsunamis are sea waves created by underwater earthquakes. When a tsunami is generated and makes its way to the shoreline, it can cause extensive damage to nearby structures and infrastructure, as well as significant inland flooding. Tsunamis generally occur in the Pacific

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Ocean but there have been some recorded events of tsunamis in the Caribbean area of the Atlantic Ocean.

Tsunamis are not generally considered a threat along the eastern seaboard of the continental U.S. The National Oceanic and Atmospheric Administration (NOAA) prepared a Tsunami Mitigation Plan for the Senate Appropriations Committee in the Fall of 1995 that included an area of mapped tsunami risk. This area did not include the eastern U.S. and only showed the tsunami risk area to include coastline along Alaska, California, Hawaii, Oregon and Washington.

Recent findings have indicated that tsunamis can occur along coastal Virginia and North Carolina. In coming years, tsunami scenarios for these portions of the Atlantic Coast will be further studied. However, the South Carolina coast is not currently included as part of this potential risk area and at present, the South Carolina Geological Survey does not consider tsunamis to be a significant hazard to the State. There are no recorded occurrences of tsunamis in Beaufort County, but this plan considers the hazard a serious one, and plans to mitigate against it because of the devastating nature of only one occurrence.

Volcanic Hazards

Volcanic eruptions threaten human life as well as buildings and infrastructure. Among the hazards of volcanic eruptions are lava flows and domes, ashfalls and gasses, and lateral blasts. There are more than 65 active or potentially active volcanoes in the United States; 55 of these volcanoes have been active since the U.S. was founded. While volcanic eruptions can pose a serious threat to life and property, most of the United State's volcanoes are located in Alaska. On the mainland of the U.S., only western states have been identified as being vulnerable to volcanic hazards; this vulnerability is based on the possibility of the areas being subject to lava flows and ashfall (FEMA's Multi-Hazard Identification and Risk Assessment Report, 1997). Therefore, volcanic hazards are not considered a threat to Beaufort County.

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Table 2-14: Overall Hazard Probability

Hazard	Probability (Percent Chance)
Fire	100
Thunderstorm and Wind	100
Flood (Widespread)	46.88
Drought	32.81
Tornado	27.69
Hurricane/Tropical Storm	12.66
Winter Weather (Snow>10")	1.50
Earthquake	0.32
Avalanche	n/a
Tsunami	n/a
Landslide	n/a
Dam Failure	n/a

Table 2-14 represents the overall probability for each of the hazards discussed annually. If the is given as "n/a," that simply means that the hazard has not occurred in the recorded history, according to the data from the SCHRL.

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3. Vulnerability Assessment

The results of the Hazard Identification indicate that some of the hazards warrant a Vulnerability Assessment. A Vulnerability Assessment is performed to determine the impact that hazards have on the built environment and how they can affect people's safety. For those natural hazards occurring frequently or those which have caused major damage in the County, a vulnerability assessment was deemed appropriate. Therefore, the effects of flooding, wind events and earthquakes on Beaufort County will be analyzed. Some hazard events that were identified, such as thunderstorms and tornadoes, are considered to be events that create much larger hazards, such as flooding and wind hazards. This analysis recognizes such, and addresses vulnerability considering that. Overall, unless this analysis indicates so, all hazards appear to affect each of Beaufort County's multiple jurisdictions equally. Both during and after the Vulnerability Assessment, LCOG staff consulted with Committee members individually and organizationally to ensure that both the data and the analysis truly reflected current conditions in the jurisdictions. Changes were made as needed.

Vulnerability Summary

The hazards to which Beaufort County has a notable vulnerability to are discussed in this section, and available data has been used. The tables below reflect an overall summary of description of the each jurisdictions vulnerability to each hazard.

The valuation chart, 3.1 below, shows the total number of buildings, based on the Beaufort County Tax assessor's estimates, for residential, commercial, industrial facilities. The severity/loss numbers represent the impact of hazards, and that information is reflected in the tables below.

Table 3-1: Assessment Valuation Data

Jurisdiction	Residential	Commercial
Beaufort (City)	$1,031,983,581	$471,114,592
Port Royal	$375,398,070	$211,968,200
Hilton Head	$14,602,562,305	$1,495,146,354
Bluffton	$7,169,121,590	$1,034,367,793
Unincorporated County	$5,082,836,415	$284,806,634
TOTAL	$28,261,901,961	$3,497,403,573

Source: Beaufort County Tax Assessor

Table 3-2: Loss Information per Hazard in Beaufort County 1960-2014

Hazard	Property Damage (Millions)
Flooding	22.3
Hurricane/Tropical	15.8
Drought (Including Crop Damage)	12.7
Thunderstorm	3.2
Tornado	2.5
Winter Weather	2.2
Wind	1.5
Wildfire	0.4

Source: USCHRL

Social Vulnerability

Social vulnerability examines the socioeconomic and demographic character of places and helps to explain the variation in the population's ability to prepare for and respond to hazards. The Social Vulnerability Index (SoVI) is a statistical measure that compares social vulnerability to environmental hazards among places, and then visually displays these comparisons on a map. SoVI thus illustrates where there is uneven capacity for preparedness and response and where additional planning and response resources might be used most effectively to help residents. The following table contains the 29 variables considered in the SoVI. For greater detail on the significance of each type of variable and its relevance to hazard vulnerability, Appendix C provides descriptions provided by the SoVI website.

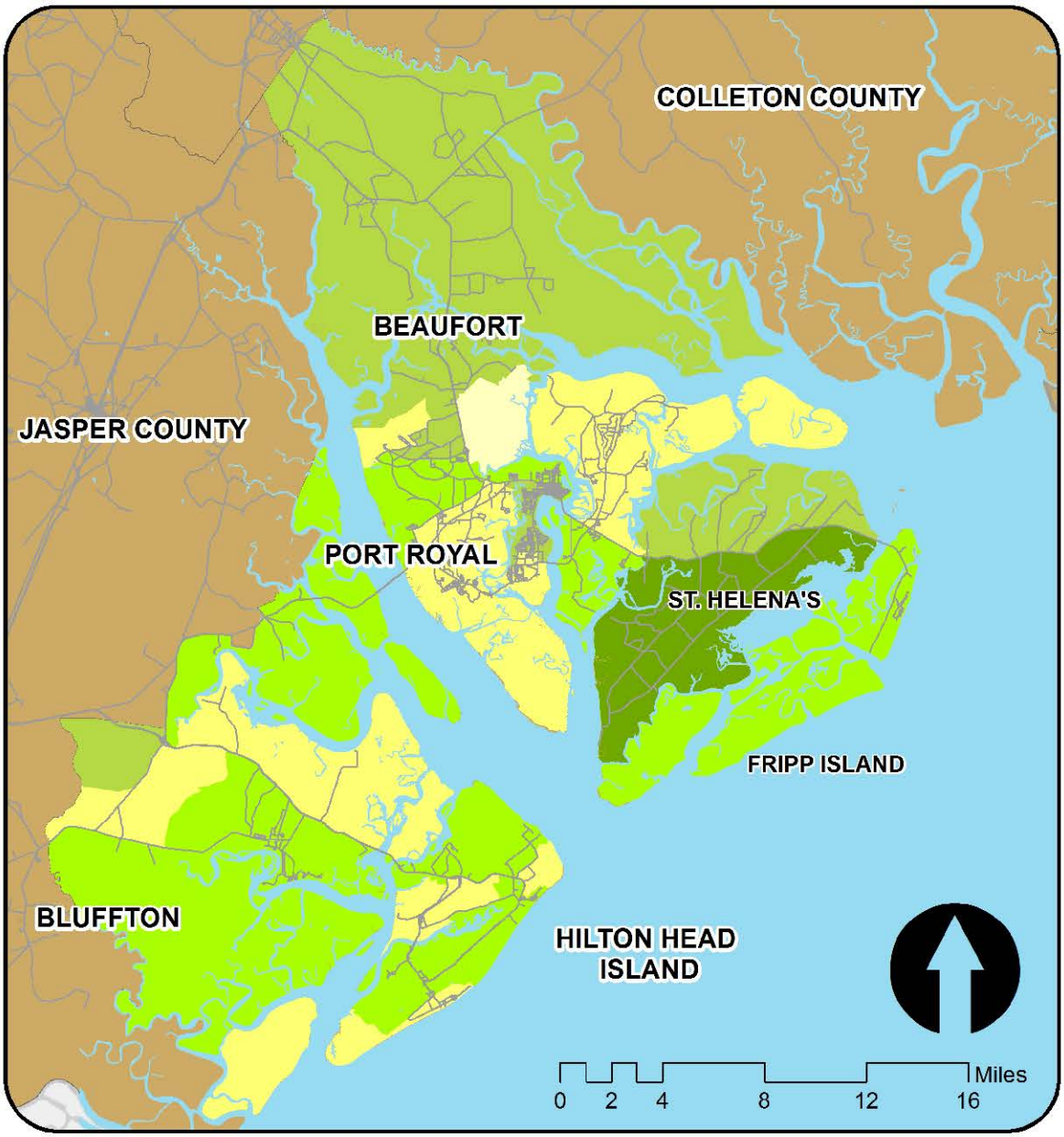
Table 3-3: 29 Variables Utilized in SoVI Analysis

Percent Asian	Percent of Population Living in Nursing and Skilled-Nursing Facilities
Percent Black	Hospitals Per Capita
Percent Hispanic	Percent of Population Without Health Insurance
Percent Native American	Percent With Less Than 12th Grade Education
Percent of Population Under 5 Years or 65 and Over	Percent Civilian Unemployment
Percent of Children Living in Married Couple Families	People Per Unit
Median Age	Percent Renters
Percent of Households Receiving Social Security	Median House Value
Percent Poverty	Median Gross Rent
Percent of Households Earning Greater Than $200,000 Annually	Percent Mobile Homes
Per Capita Income	Percent Employment in Extractive Industries
Percent Speaking English as a Second Language with Limited English Proficiency	Percent Employment in Service Industry
Percent Female	Percent Female Participation in Labor Force
Percent Female Headed Households	Percent Housing Units with No Car
	Percent Unoccupied Housing Units

Source: http://webra.cas.sc.edu/hvri/products/sovifaq.aspx

According to SCEMD, Beaufort County has a wide range of social vulnerability, with most tracts exhibiting moderate levels. Figure 3-1 depicts the SoVi analysis for Beaufort County with the highest vulnerability indicated by the dark green areas. Northern Beaufort County, as a whole, shows high levels of vulnerability with one particular area of concern being St. Helena's Island. With the 29 variables examined in the SoVi analysis, it is difficult to judge which individual factors contribute the most to this classification. A review of economic and demographic data shows St. Helena's Island as among the poorest areas in the County, and per the Hazus analysis, it has many mobile homes that are especially vulnerable in wind and flood. Taking these factors into account, additional action should be taken to identify the needs of residents, and what other issues may be considered in planning for hazard preparedness and recovery.

Figure 3-1: Social Vulnerability



Source: SCHVRI and ESRI

Social Vulnerability

- Low
- Medium Low
- Medium
- Medium High
- High

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Inventory Information

In order to assess the vulnerability of the community, particularly to natural hazards, an inventory of the county's structures and critical facilities was performed.

ArcGIS shape files with existing structure locations were provided by Beaufort County for all unincorporated areas and for the City of Beaufort and the towns of-Bluffton, Port Royal and Hilton Head Island in Beaufort County. This information includes structures digitized from aerial photography as well as updates based on recent Certificates of Occupancy as they are issued.

Critical facilities are those facilities that warrant special attention in preparing for a disaster and/or facilities that are of vital importance to maintaining citizen life and health safety, and community order during and/or directly after a disaster event. Beaufort County has prepared an inventory of critical facilities that includes emergency response facilities such as police stations, fire departments, emergency medical services stations (EMS) and medical centers/hospitals; public facilities including schools and local government buildings; and important transportation facilities including airports. Hazard Mitigation Planning Committee members reviewed and updated the county's list during the planning process. A count of the types of facilities in each community is provided in Table 3-4.

Table 3-4: Critical Facilities

Facility Type	Emergency Facilities	Military Facilities	Schools	Public Buildings	Utilities	Airports	Commercial Facilities	Total
Incorporated Communities								
Beaufort	10	1	8	10	4	1	---	31
Bluffton	3	---	3	---	3-	---	---	6
Hilton Head	15	---	7	3	8	1	10	44
Port Royal	5	1	2	2	1	---	---	10
Unincorporated Areas								
Burton	3	---	4	1	---	---	1	9
Daufuskie	2	---	---	---	---	---	---	2
Chechessee	1	---	---	1	1	---	---	3
Frogmore	1	---	---	---	---	---	---	1
Lady's Island	---	---	3	1	---	---	---	4
Lobeco	1	---	1	---	---	---	1	3
Pritchardville	2	---	---	---	---	---	---	2
Seabrook	---	---	---	1	---	---	---	1
Sheldon	2	---	1	1	---	---	---	4
St. Helena	4	---	2	1	1	---	---	7
Total in Unincorporated Areas								36

Flooding

This section discusses the vulnerability of Beaufort County to damage by the flooding described in the Hazard Identification. Flood problems arise when floodwaters cover developed areas, locations of economic importance and infrastructure. Damage to buildings, particularly residential buildings, is usually the largest single flood problem a community faces.

Floodplain

The majority of land in Beaufort County lies within the 100-year floodplain as shown on the communities' FIRMs. Therefore, a significant portion of existing development in the County is located in 100-year flood zones and is vulnerable to flooding and flood damages.

Flood Depths

Base flood elevations within the County range from 22 ft NGVD within VE zones on Hilton Head Island to 8 ft NGVD in inland areas of the northern county. Flood depths within the county also vary.

City of Beaufort

In the City of Beaufort, properties along the Beaufort River in the downtown portion of the city are subject to flood depths of about 3-6 feet during the base flood according to FEMA FIRM base flood and reference mark elevations. The base flood elevation along the river here is 13 ft NGVD while ground elevations range from approximately 7 feet (at the end of Hancock Street by Beaufort River) to approximately 11 feet on the northwest side of the intersection of Carteret and Port Republic Streets.

Town of Bluffton

Within incorporated Bluffton, the majority of development lies outside of the 100-year floodplain. There are some developed areas along the May River that lie within the Town of Bluffton where the base flood elevation is 13 ft. NGVD. Ground elevations along the May River in developed areas within the Town are about 8-12 ft. NGVD. Therefore, a very limited amount of structures within the town are subject to base flood depths of 1-5 feet.

Town of Hilton Head

Within the Town of Hilton Head Island, most areas are subject to flood elevations of about 14ft NGVD, although the flood elevations along the shoreline range from 22 ft. to 15ft NGVD. According to reference marks on the Hilton Head Island FIRMs, much of the inland areas are subject to flooding of about 1-3 feet in depth. Most of the built environment near the coastline in Hilton Head Island lies in areas subject to base flood elevations of 14-15 ft. NGVD; ground elevations in these areas generally range from 8 to 12 feet resulting in base flood depths of 3 to 7 feet. However, in some areas where properties are located further towards the shoreline and within VE zones, base flood depths are higher. In the Forest Beach Drive area, several structures located seaward of the road are within VE zones with water surface elevations of 18-20ft NGVD while ground elevations are approximately 12 ft. NGVD, resulting in flood depths of 6-8 feet.

Town of Port Royal

Within the Town of Port Royal, most of the mapped base floodplain that affects the developed area is located along the Beaufort River in the southern portion of the Town. This includes properties along Sixth through Tenth Streets, eastern portions of Eleventh and Twelfth Streets, and southern portions of Richmond, London, Paris, and Madrid Avenues. The base flood elevation here is 13 ft NGVD. Ground elevations are mostly 4-8 feet south of Seventh Street, and 9-13 feet between Seventh and Tenth. Therefore, south of Seventh Street, flood depths are about 5-9 feet for the 100 year flood, while between Seventh and Tenth, depths are less than 1 foot up to 4 feet.

Unincorporated County – Bluffton Township

In the Moss Creek Plantation area, portions of the community lie in the base floodplain. Flood depths for the base flood range from about 1 to 9 feet; the BFE here is 14ft NGVD and ground elevations range from 5 ft NGVD upward.

Unincorporated County – Daufuskie

In northwestern Daufuskie where the BFE is 14-15 ft NGVD, ground elevations are 4-9 ft NGVD resulting in base flood depths of about 5-11 feet. In central Daufuskie along the Calibogue sound, BFE's range from 14-16ft NGVD while ground elevations are at 4 ft near the shoreline. Slightly further inland where the BFE is 14ft NGVD, ground elevations are from about 6 to 9 ft NGVD putting flood depths in this area from 5 to 11 feet.

Unincorporated County – Fripp Island

Fripp Island's development consists mostly of the Fripp Island resort which spans 3-1/2 miles of coastline along the Atlantic Ocean. The base flood elevation within the majority of this development is 13ft NGVD, while ground elevations range from 4 ft NGVD to 10 ft NGVD. Therefore, flood depths are an estimated 3 to 9 feet. Closer to the coast, the BFE ranges from 15 to 20 ft NGVD, but landward of the frontal dune where there is development, the elevation is 15 to 16 ft NGVD and ground elevations are 4 to 11 ft NGVD. Therefore, right along the coastline, but landward of the dunes the flood depth ranges from 4 to 12 feet. Therefore, flood depths vary dramatically from as much as about 11 feet in low-lying areas near the coastline to 3 feet in areas on some of the higher ground of the development located inland where the base flood elevation is 13 ft NGVD. The Fripp Island development is relatively new with development occurring after the county joined the NFIP. Therefore, the structures are post-FIRM and should all be elevated above the level of the base flood. The flood and tide events of the fall of 2015 resulted in road flooding in several locations and some structural damage to homes. Since the beach has been accreting and dunes have been forming during the past decade, oceanfront homes are, in many cases, further from the water than previously.

Unincorporated County – St. Helena

In the Fort Fremont area of St. Helena located at the mouth of the Beaufort River, there is development located along the river within the base floodplain; the base flood elevation here is 13-14 ft NGVD. Ground elevations of properties located adjacent to the river are generally

5-8 ft NGVD where the BFE is 14 ft NGVD. East of Bay Point Road/Fort Fremont Road, ground elevations in developed areas are about 5-9 ft NGVD while the BFE is 13 ft NGVD. Therefore, flood depths are approximately 4-9 feet in the Fort Freemont area for the 100-year flood.

Along Sea Island Parkway in eastern St. Helena, a significant portion of the developed area is within the 100-year floodplain. The base flood elevation ranges from 14-15 ft NGVD in and ground elevations are generally 6-10 ft NGVD in much of the developed areas. This puts flood depths as high as 9 feet in some areas with a range of 4-9 feet.

Unincorporated County – Sheldon-Dale

Along the Coosaw River in the Sheldon-Dale area, the base flood elevation is 13 ft NGVD according to the county's FIRMs. Flood depths in this area are then an estimated 1-5 feet as ground elevations in the developed area generally range from 8 ft NGVD upwards.

Flood Prone Structure Counts

Table 3-5 provides the results of the analysis indicating the number of structures in Beaufort County and its incorporated areas that are vulnerable to flooding according to the data supplied by the jurisdictions and the building shape files, and is deemed to be relatively up-to-date.

The data supplied in Table 3-6, shows that a significant portion of the structures in Beaufort County lie within the 100-year floodplain. On Hilton Head, the incorporated area with the most structures (over 19,000), an estimated 76 percent of structures are located in the 100 year floodplain. Thus, the vast majority of the town's structures lie within areas vulnerable to flooding where there is at least a 1 percent chance of being flooded in any given year. In the City of Beaufort, where there are over 6,000 structures, approximately 30 percent lie within the 100-year floodplain. In Port Royal, 40 percent of structures lie within the 100-year floodplain. The Town of Bluffton, including newly annexed areas, has a relatively low percentage of structures within the 100-year floodplain; only 293 structures, or about 3 percent of the town's total structures, lie within the 100-year floodplain.

Table 3-5: Number of Structures in Flood Areas

Community	V Zone(s)	A Zone(s)	Subtotal	X-500	X-Zone	Total
	100-Year Flood Zone					
Beaufort County (Unincorporated)	217	19,793	20,010	1,210	29,698	50,918
Beaufort (City)	0	1,928	1,928	1,210	3,126	6,264
Bluffton	0	293	293	12	7722	8,027
Hilton Head	90	14,802	14,892	505	4,068	19,465
Port Royal	27	1,367	1,394	367	1600	3,361

Source: FEMA, Beaufort County GIS, LCOG

Forty percent of structures in the unincorporated portion of the County are located in the 100-year floodplain. Beaufort County is divided into seven planning districts that include the entire County. One of these is the Hilton Head Island District, which is in the unincorporated part of the island. The remaining six planning districts encompass larger portions of the unincorporated County. Building count results for these areas are presented in Table 3-6.

Figure 3-2: Beaufort County Planning Districts

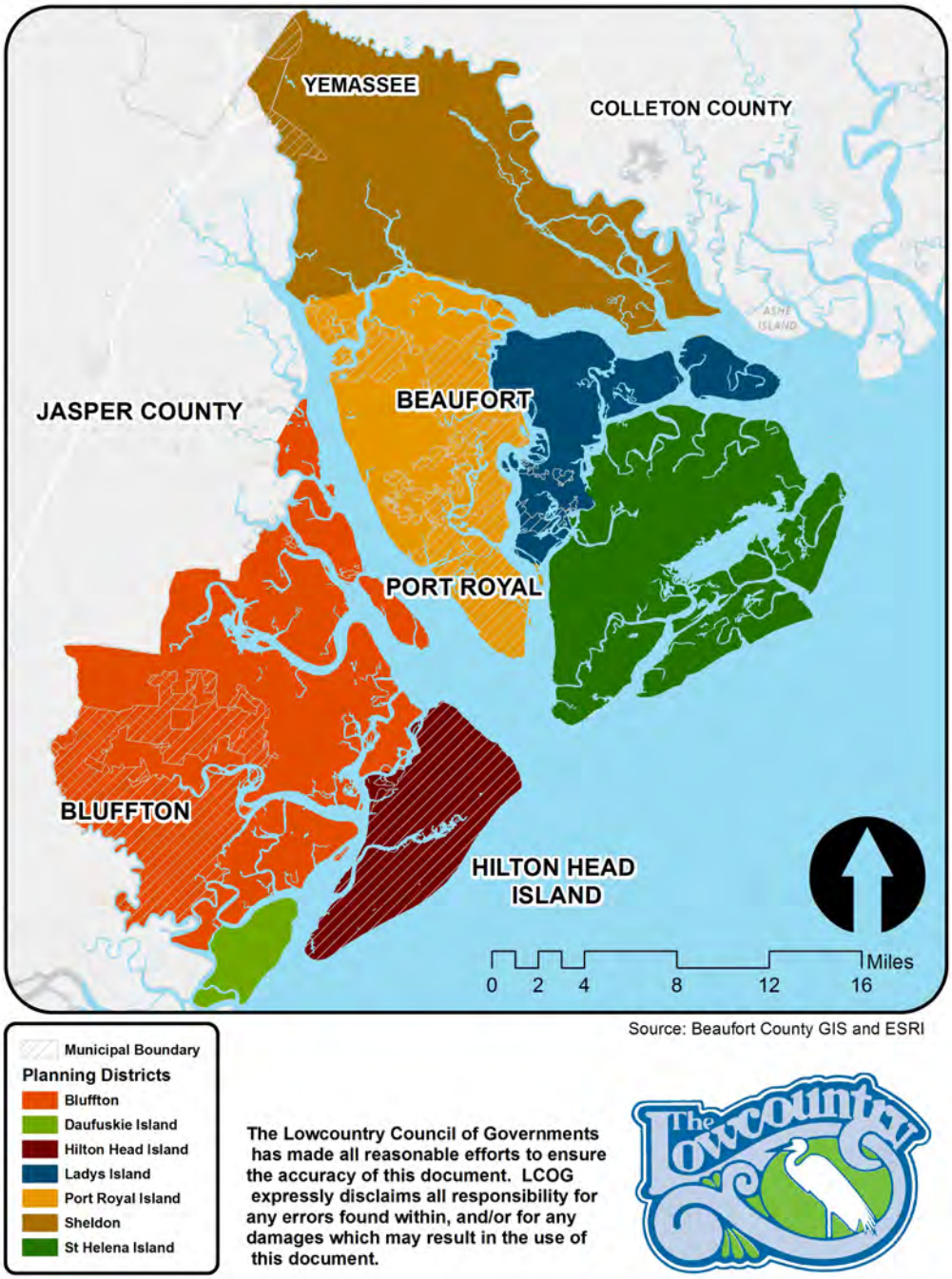


Table 3-6: Structures in Flood Zones in Unincorporated Beaufort County by Planning District

COMMUNITY	V ZONE(S)	A ZONE(S)	*SUBTOTAL*	X 500	X ZONE	*TOTAL*
	100-YEAR FLOOD ZONE					
BLUFFTON TOWNSHIP	------	5,867	5,867	1,715	13,546	21,128
DAUFUSKIE ISLAND	32	391	423	71	248	742
HILTON HEAD ISLAND	------	727	727	------	53	780
LADY'S ISLAND	------	2,797	2,797	71	3,851	6,719
PORT ROYAL ISLAND	------	2,727	2,727	77	8,190	10,994
SHELDON	------	948	948	531	2,066	3,545
ST. HELENA	184	6,311	6,495	145	1,742	8,382

Source: FEMA, Beaufort County GIS, LCOG

Most of the structures in the unincorporated County are located in the northern portion of the County outside and to the east of the Beaufort/Port Royal area. The planning district with the highest overall number of flood-prone structures is St. Helena Island which includes the Frogmore area and Fripp's Island. There are over 6,000 structures in this area located in the 100-year floodplain. The Port Royal Island area has about 2,700 flood-prone structures, and the unincorporated Bluffton area has nearly 6,000 structures located in the 100-year floodplain.

Flood insurance policy information was provided by SC Department of Natural Resources and the jurisdictions and is presented in Table 3-7. Note that flood insurance is available to anyone in the County (except those in CoBRA zones), even those structures outside of the mapped floodplain area. Therefore, in some cases, the number of policies includes policies for structures that are not in the mapped floodplain.

Table 3-7: Flood Insurance Policies 2015

Community	No. Structures in the 100-year Floodplain	No. of flood insurance Policies
Unincorporated County	20,010	22,877
Beaufort (City)	1,928	1,510
Bluffton	293	139
Hilton Head	14,171	28,655
Port Royal	1,394	399

Source:SCDNR

In addition to performing a count of structures in the 100-year floodplain zones, a count of structures in storm surge zones was completed. This was done for each of the Category 1 through 5 surge zones and is divided by planning area. Results of the analysis are presented in 3-8.

Table 3-8: Structures in Storm Surge Zones in Beaufort County by Planning District 2015

Planning District	Category 1		Category 2		Category 3		Category 4		Category 5		Total
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
Bluffton Township	1,526	5.2%	5,799	19.9%	15,094	51.7%	20,405	70.0%	23,818	81.7%	29,170
Daufuskie	154	20.8%	406	54.7%	706	95.1%	715	96.4%	715	96.4%	742
Hilton Head Island	7,062	35.3%	13,686	68.4%	18,728	93.5%	19,981	99.8%	19,981	99.8%	20,022
Lady's Island	977	14.2%	2,297	33.4%	3,949	57.4%	5,462	79.4%	6,469	94.1%	6,878
Port Royal Island	1,661	8.1%	4,591	22.5%	9,599	46.9%	14,353	70.2%	16,655	81.4%	20,449
Sheldon	530	14.7%	1,566	43.5%	2,663	73.9%	3,228	89.6%	3,571	99.1%	3,604
St. Helena	3,489	41.6%	6,178	73.7%	7,071	84.4%	7,645	91.2%	8,144	97.2%	8,382

Critical Facilities

Beaufort County's and Hilton Head Island's critical facilities GIS coverage was used as the basis for determining the county's critical facilities. Steering Committee members reviewed the list of facilities included in this coverage and made modifications as appropriate. A total of 128 facilities within the County were identified as critical. Analysis of their locations in 2015 showed that 71 of these facilities are located within the 100-year floodplain; all of these are in the AE zone. Seventeen of these facilities lie within incorporated areas of the County. Six of them are in the City of Beaufort, 3 are in Bluffton, 46 are on Hilton Head and one is in Port Royal. Most of the remaining facilities are located in unincorporated portions of Northern Beaufort County with one exception; one facility is located in the southern part of the county near the Jasper County border. Table 3-9 provides the name of the facilities and address information where it is available.

Table 3-9: Critical Facilities Located in the 100-Year Floodplain in Incorporated Communities

Location	Facility
Beaufort	
2510 Mossy Oaks Road	Mossy Oaks Elementary School
2501 Mossy Oaks Road	Beaufort Middle School
2519 Mossy Oaks Road	Beaufort Fire Dept. Station 2
311 Scott Street	Beaufort County Library

237 Sea Island Pkwy	Lady's Island Airport
501 Charles St	Beaufort Post Office
Bluffton	
51 W. Old palmetto Bluff Road	Water Storage Tank
52 Cecil Reynolds Drive	Santee Cooper Electric Substation
Whitehouse Plantation Road	Palmetto Bluff WWTP
Hilton Head Island	
40 Summit Drive	Hilton Head Island Fire and Rescue Headquarters
21 Oak Park Drive	Hilton Head Island Fire and Rescue Dispatch
70 Cordillo Pkwy	HHI Fire and Rescue Station #1
65 Lighthouse Road	HHI Fire and Rescue Station #2
534 William Hilton Pkwy	HHI Fire and Rescue Station #3
400 Squire Pope Road	HHI Fire and Rescue Station #4
20 Whopping Crane Way	HHI Fire and Rescue Station #5
12 Dalmation Lane	HHI Fire and Rescue Station #6
1001 Marshland Road	HHI Fire and Rescue Station #7
120 Beach City Road	Beaufort County Airport Terminal Building
27 Dillon Road	Fire Station #9 (Airport)
1 Town center Court	Municipal Government Offices
3 Town Center Court	Court
539 William Hilton Pkwy	Beaufort County Government Offices
10, 70, 80 Wilborn Road	Beaufort County Schools Hilton Head Campus
165 Pembroke Drive	Hilton Head Island Early Childhood Center
58 Shelter Cove Lane	Beaufort County Sheriff’s Department
980 William Hilton Pkwy	Wexford Plantation Security Office
10 Shipyard Drive	Shipyard Plantation Security Office
399 Long Cove Drive	Long Cove Plantation Security Office
10 Queens Folly Road	Palmetto Dunes Plantation Security Office
1 Brams Point Road	Spanish Wells Entrance Gate Security Office
3 Marina Side Drive	Broad Creek PSD
25 Bow Circle	South Island PSD-Main Office
21 Oak Park Drive	Hilton Head No 1 PSD
870 William Hilton Parkway	Hargray Telephone Company
111 Mathews Drive	Palmetto Electric Coop
4 Nature’s Way	Jarvis Creek Pump Station
179 Greenwood Drive	Sea Pines Lawton Canal Pump Station
54 Yorkshire Drive	Wexford Canal Pump Station
183 Mathews Drive	Hilton Head PSD Water Storage Tank

65 Gardner Drive	Hilton Head PSD-Well Tower #1
91 Union Cemetary Road	Hilton Head PSD-Well Tower #9
41 Shelter Cove Lane	Broad Creek PSD- Pump Station
2 Saint George Road	Broad Creek PSD-Well
106 A Cordillo Pkwy	South Island PSD-Water Storage Tank
2 Lawton Canal Road	South Island PSD-WTP
122 Cordillo Pkwy	South Island PSD-FB Lift Station #3
75 Lighthouse Rd	Palmetto Electric Coop- Sea Pines Substation
100 Lawton Drive	Palmetto Electric Coop- Heritage Substation
7 Dunnagan's Alley	Palmetto Electric Coop- Market Place Substation
5 Marina Side Drive	Palmetto Electric Coop- Long Cove Substation
149 Mathews Drive	Palmetto Electric Coop-Folly Field Substation
41 Power Alley	Santee Cooper Electric Substation
249 William Hilton Pkwy	Santee Copper Electric Substation
175 Greenwood Drive	Sea Pines Plantation Security Office
Port Royal	
700 Paris Avenue	Port Royal Town Hall

Table 3-10: Critical Facilities Located in the 100-Year Floodplain of the Unincorporated County

Location	Facility
Chechessee	
6 Snake Road	BJWSA
Colleton River	
2 Oak Hill Ct	Bluffton Station 36
Dataw	
Polowana Rd	Water Storage
Lady's Island	
146 Lady's Island Drive	Lady's Island Fire District 1
73 Chowan Creek Bluff	Lady's Island Elementary
Okatie	
Okatie Maintenance Yard	Cherry Pointe Water Storage
Seabrook	
2009 Trask Pkwy	Whale Branch Middle School
15 Stuart Point Road	Whale Branch Elementary School
219 Seabrook Point Dive	Seabrook Post Office

ST. HELENA	
74 Polowana Road	Lady's Island/ St. Helena Fire Dept Station #24
291 Tarpon Blvd	Fripp Island Fire Department
1609 Sea Island Pkwy	Lady's Island/ St. Helena Fire Dept Station #23
774 Sea Island Pkwy	St Helena Post Office
Old Polowana Rd	St Helena WWTP
Swingabout Rd	St Helena Water Storage

Repetitive Loss Areas

A repetitive loss structure is defined by FEMA as any structure for which two or more flood insurance claims have been paid for more than $1,000 in a 10-year period. While these properties make up only 1-2 percent of the flood insurance policies currently in force, they account for 40 percent of the country's flood insurance claim payments. A report on repetitive loss structures recently completed by the National Wildlife Federation found that 20 percent of these structures are listed as being outside of the 100-year floodplain. FEMA has reported that the NFIP's 75,000 repetitive loss properties have already cost billions of dollars in flood insurance payments and numerous other flood-prone properties continue to remain at high risk in the Nation's floodplains. Therefore, there are several programs that encourage communities to identify the causes of their repetitive losses and to work to mitigate these losses.

Identifying areas of repetitive losses within a community is a good indicator to use in determining areas of the highest flood damage vulnerability. Although flood damage is not necessarily limited to these areas, repetitive loss data provides location indicators for areas where structures are experiencing recurring and costly flooding damage.

Unincorporated County

The County's participation in the Community Rating System has encouraged a thorough review of repetitive loss structures. As a result, many of the previously listed repetitive loss properties have been investigated and in some cases mitigated so that many of the structures are no longer considered repetitive losses.

There are currently no repetitive loss structures located in unincorporated Beaufort County. Seven structures were removed from the list for various reasons including two structures for which flood protection mitigation in the form of stormwater management improvements were provided and funded by the property owner. Additionally, one listing was an error, and for one structure, the cause of flooding was not identifiable. Three structures are situated on

the Hunting Island State Park area and are not under the jurisdiction of the County, but fall under the jurisdiction of the South Carolina Office of Parks and Tourism.

Beaufort

There are no repetitive loss properties in the City of Beaufort. Since the original plan was written, two properties were taken off the list.

Bluffton

There are no repetitive loss structures in Bluffton.

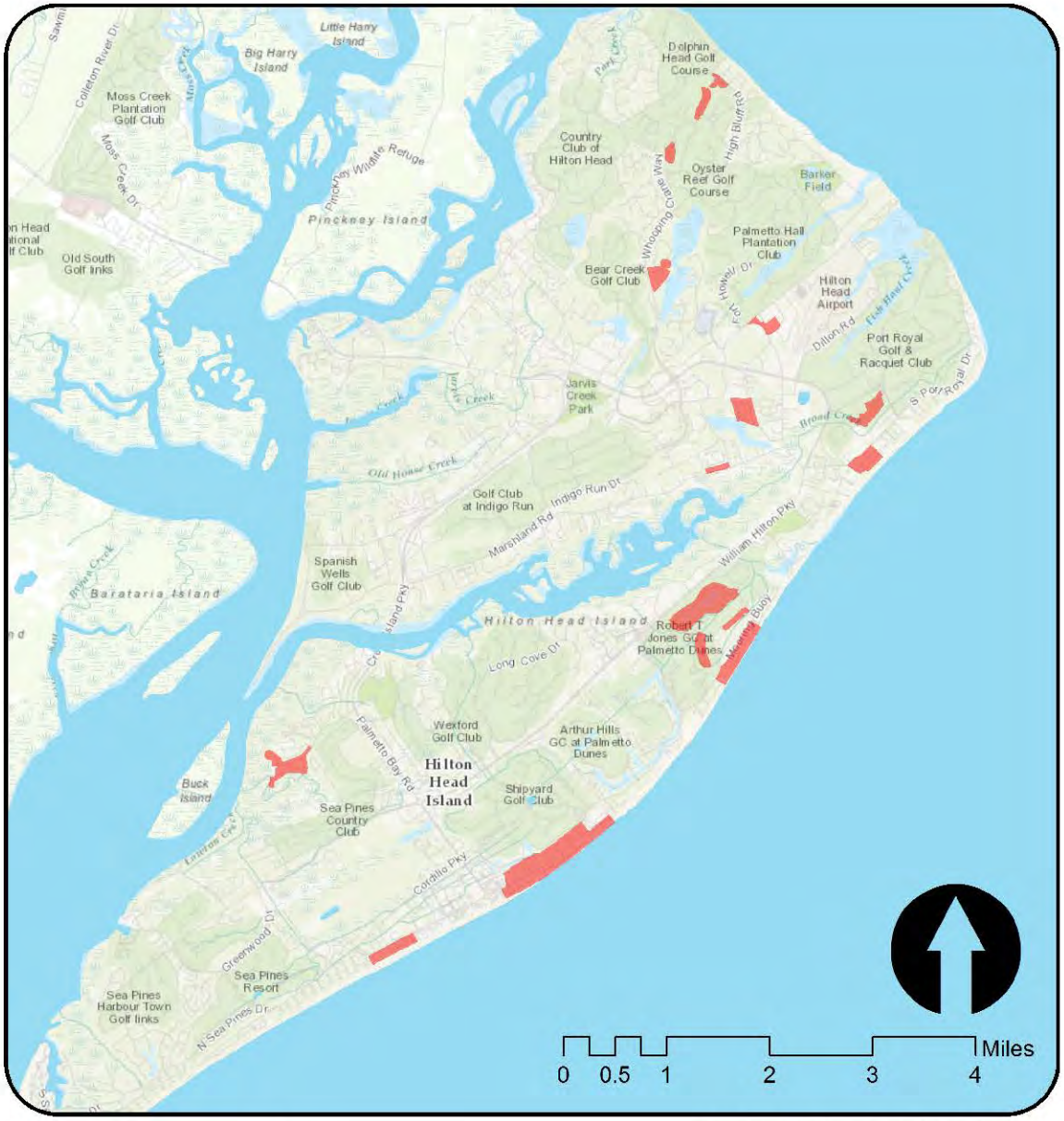
Hilton Head

The Town of Hilton Head's participation in CRS has also encouraged a review of this community's repetitive loss structures which has resulted in the mitigation and/or removal of many structures from the list. Currently, there are 24 properties on the repetitive loss list for the town, twelve of which are insured. Nineteen of the structures are single family dwellings, two are multifamily, and one is non-residential.

A GIS coverage of the repetitive loss areas provided by the town allowed for the following observations of the properties:

- 19 of the properties are located in the A flood zone.
- 5 of the properties are in the X500 zone which is outside the 100-year floodplain. Two of these are within 200 feet of the AE zone.
- 11 of the properties are located along or near the Atlantic Coast side of the island in the Forest Beach area adjacent to the V zone.
- 1 is located in the Palmetto Bay area along Broad Creek at its confluence with the Intracoastal Waterway.
- 2 are in the Palmetto Dunes area, approximately ½ mile inland.
- 3 properties are on northeastern part of the island on the Atlantic Coast Side.
- 5 of the properties are on the northeastern part of island.
- 2 of the properties are located mid-island.

Figure 3-3: Repetitive Loss Areas on Hilton Head Island



Source: HHI Planning, LCOG, and ESRI

Repetitive Loss Areas

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Port Royal

There are no repetitive loss properties in the Town of Port Royal.

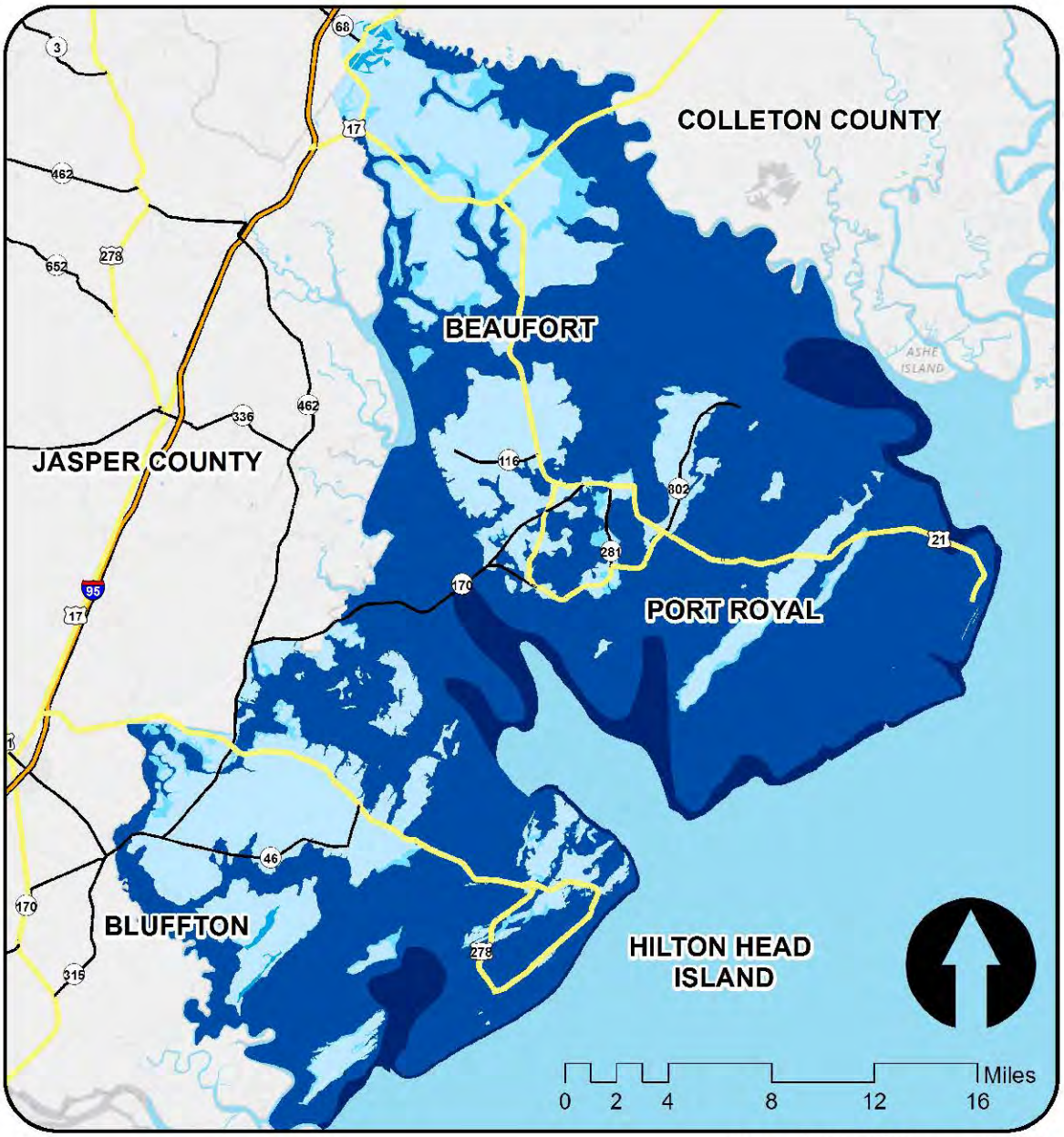
Access

In addition to building and facility vulnerability, communities must consider transportation and roadway accessibility during and after a flood. Drowning in vehicles is the number one cause of flood deaths. If residents wait too long to evacuate, flooding may impact their chances of being able to get out of potentially dangerous areas. The question of returning evacuees bears consideration as well. Although most people are in a hurry to return after a flood to assess damage and begin repairs, flooded roadways and bridges can prevent them from accessing these structures for several days.

Because a majority of the land area within the county lies in the 100-year floodplain, portions of all of the major highways within the county would be inundated by a 100-year event. As illustrated in Figure 3-4, this includes the major portions of South Carolina Routes 116, 170, and 802 in the Beaufort City and Port Royal areas. In the northern portion of the county, it includes much of US Route 21 from Fripp Island up to the Sheldon area. Major portions of U.S. Route 17 would also be inundated by the 100-year flood. In Southern Beaufort County which includes Hilton Head and Bluffton, approximately half of the length of US Route 278 lies within the 100-year floodplain. Additionally, most of South Carolina Route 170 in Southern Beaufort would be inundated.

An important fact in considering Beaufort's evacuation routes is that there essentially are no alternatives to the ones existing now because of the topography of the area. Because of Beaufort County's physical composition, bridges should be considered as critical facilities because they are the essential connectors for both people and essential goods. Their future evaluation for planning activities is therefore of critical importance.

Figure 3-4: Major Routes in the Floodplain in Beaufort County



Source: FEMA, U.S Census and ESRI

Flood Zone
- X
- X500
- A
- AE
- VE

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It is also important to note that highway miles have stayed relatively constant, while both population and vehicle registration have increased considerably. This is a cause for concern for the area due to the challenges faced in coordinating evacuation.

Table 3-11: Increases in Vehicle Ownership

Registered Motor Vehicles								
	2000	2005	% Change	2009	% Change	2014	% Change	% Change 2000-2014
Beaufort	89,851	128,351	42.85%	131,226	2.24%	148,177	12.92%	64.91%
Colleton	27,653	38,209	38.17%	35,019	-8.35%	36,108	3.11%	30.58%
Hampton	13,733	17,605	28.19%	16,320	-7.30%	16,296	-0.15%	18.66%
Jasper	13,696	20,728	51.34%	21,673	4.56%	24,866	14.73%	81.56%
TOTAL	144,933	204,893	41.37%	204,238	-0.32%	225,447	10.38%	55.55%

Source: SCDOT

Conclusions

The analysis suggests that while the entire county is vulnerable to flooding and flood damages, there are some areas where this threat is greater due to the amount of land area susceptible to flooding, and the amount of development within these areas. While the Town of Bluffton and the unincorporated area of the County known as Sheldon have relatively smaller vulnerabilities to flooding, the Town of Hilton Head Island, the City of Beaufort, the Town of Port Royal, and unincorporated areas of the county including Daufuskie and St. Helena islands, and areas directly surrounding Hilton Head Island, have larger numbers of structures and more infrastructure exposed to flooding.

Erosion

The South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (DHEC-OCRM) publishes the *Annual State of the Beaches Report* which summarizes changes that have occurred along the state's shoreline. Results of the 2009 report, in addition to more current information from the Army Corps of Engineers for Beaufort County are presented above in Table 2-7. The table notes what, if any, type of shoreline change is occurring for the given area; what the average long term change rate is; whether or not the area is an unstablized inlet zone, which is the type of shoreline zone where the greatest amount of change is likely to occur; and the date of the last nourishment project in the area. By using this chart for analysis, which is the best data available, Beaufort's susceptibility to damage and loss from erosion can be better understood.

Beaufort County is vulnerable to erosion, but there are no critical facilities in a highly unstable area. While erosion exists as a hazard, for the purpose of this plan, vulnerability and mitigation are addressed primarily through the flooding and other items.

Development Trends

To understand the vulnerability of the built environment within each community, an assessment of the development trends was necessary. This allows us to focus on where and what type of future development will occur and thus determine how to fortify it to be hazard resistant. As noted in Chapter 1, Beaufort County is one of South Carolina's fastest growing counties, by percentage of population change, with an overall population increase of 40 percent in the 1990s, 29 percent from 2000 to 2010 and 45 percent between 2000 and 2014. This suggests significant development of residential structures as well as commercial structures and infrastructure to keep up with the resulting demand.

Table 3-12: Population Increase 2000-2014

	Census 2000	Census 2010	2011 Estimates	2012 Estimates	2013 Estimates	2014 Estimates	Percent Change 2000-2010	Percent Change 2010-2014
Beaufort County	**120,937**	**162,233**	**164,217**	**168,016**	**171,569**	**175,852**	**34.15%**	**8.39%**
Unincorporated	68,900	89,117	90,173	92,217	94,320	95,614	29.34%	3.68%
Beaufort city	12,950	12,361	12,363	12,675	12,887	13,130	-4.55%	6.22%
Bluffton town	1,275	12,978	13,091	13,343	13,606	15,199	882.75%	17.11%
Hilton Head Island town	33,862	37,099	37,642	38,522	39,224	40,039	9.56%	7.92%
Port Royal town	3,950	10,678	10,948	11,259	11,532	11,870	170.33%	11.16%

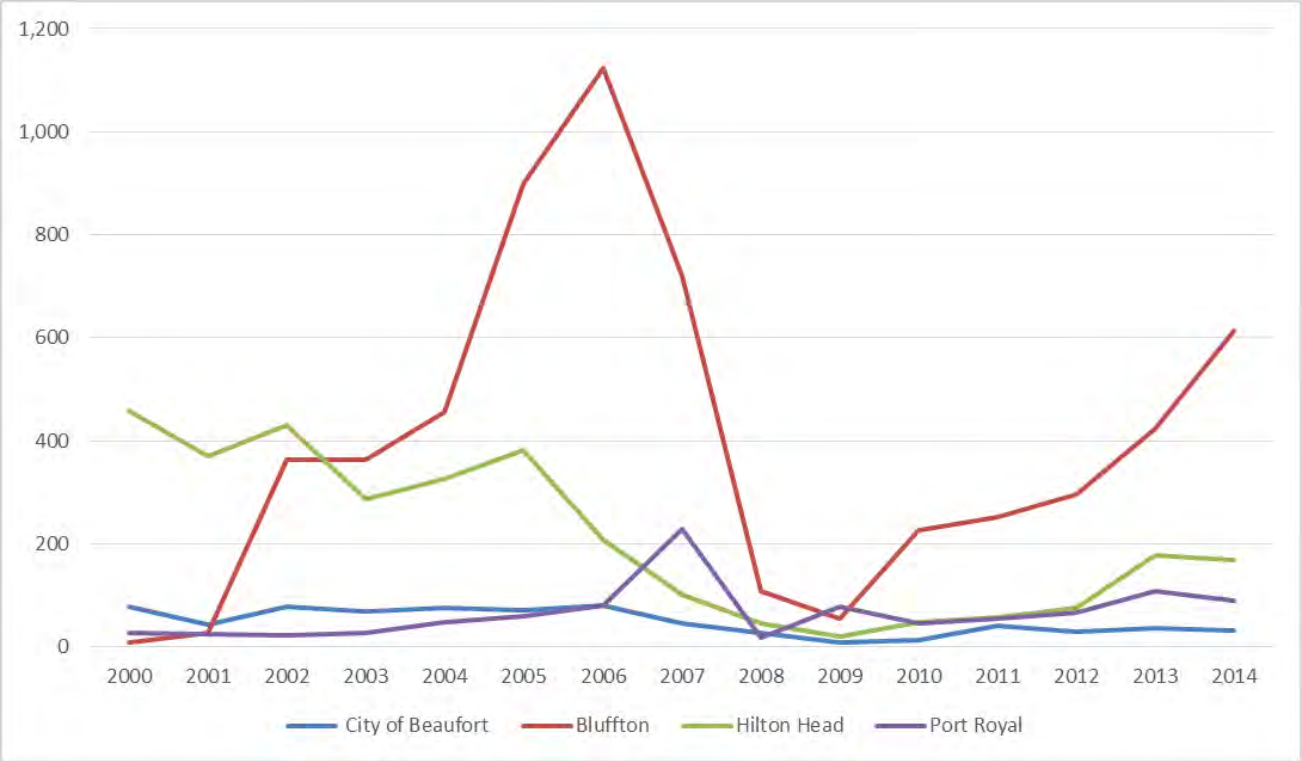
Source: US Census and ACS Data

Table 3-13: Building Permits County-Wide 2010-2014

Beaufort	Type	2010	2011	2012	2013	2014
	Single Family Number	474	567	681	988	1131
	SF Value	$175,449,646	$218,448,631	$251,515,578	$391,475,659	$535,618,780
	Average SF (w/o Land)	$370,147	$385,270	$369,333	$396,230	$473,580
	Multifamily Number	6	62	0	70	32
	MF Value	$116,877	$7,797,379	$0	$12,503,692	$2,364,116
	Commercial Number	33	30	26	35	48
	Commercial Value	$25,762,375	$25,993,222	$23,948,471	$55,730,846	$79,678,171

Source: Town and County Permit Offices

Figure 3-5: Single Family Housing Starts 2000-2014 for Incorporated Beaufort County



Source: Municipal Permit Offices

Beaufort County

Unincorporated Beaufort County continues to grow with considerable residential and commercial development occurring in areas close to the City of Beaufort, the Town of Port Royal, and the Town of Bluffton. The Town of Bluffton, however, continues to annex significant land area in southern Beaufort County. Based on U.S. Census data, it is estimated that the overall population growth in the unincorporated county was 39 percent from 1990-2000. From 2000-2014, there was 45 percent increase in population.

City of Beaufort

According to U.S. Census data, the City of Beaufort's population increased by 35 percent between 1990 and 2000, and the number of housing units in the City increased by 22 percent in this time period. From 2000-2010, population actually decreased by just over 4 percent. Recent estimates show growth rebounding slightly with a little over 6% population growth from 2010 to 2014. The city's land area is relatively small, 23 square miles, and will thus serve as a limit to growth in the future.

Town of Bluffton

The Town of Bluffton has grown considerably in overall land area over the last 10-15 years. In 1990, it had a land area of approximately 1 square mile whereas in 2000, land annexations brought the land area total to 34 square miles. As of 2015, Bluffton's land area is just over 54 square miles. Bluffton's population increased by 73 percent during the 1990's and the number of housing units in the town increased by 68 percent. This is a result of land annexation, increased development and migration to the Town of Bluffton. Referring to figure 3-5, Bluffton has outpaced the rest of incorporated Beaufort County in the number of housing starts throughout the last decade.

Town of Hilton Head Island

The Town of Hilton Head Island has remained steady in terms of growth over the last decade. The Town is generally a resort and retirement community with many plantation type residential developments as well as considerable commercial offerings to support residents and vacationers. From 1990 to 2000, the population of Hilton Head Island increased 43 percent to an estimated 33,900 people. Housing units in the town increased only by 15 percent in that time. From 2000-2014, the population increased by 18 percent.

Town of Port Royal

Within the Town of Port Royal, population increased by 32 percent in the 1990's with the number of housing units increasing by 40 percent. The Town continues to experience significant growth and to annex portions of the county along its borders. The Town population increased by 200% percent from 2000-2014. Housing starts have risen steadily throughout most of the past decade, with the exception of the precipitous decline experienced in 2008.

Summary

Beaufort County has experienced major growth since 1990 as its cultural and natural beauty has made it a top destination for visitors and retirees, both nationally and internationally. Nationwide, population continues to concentrate along the coast, which presents opportunities and challenges for communities adapting to increased demand for services. Data shows that Southern Beaufort County, particularly the Bluffton area, has experienced the fastest growth overall when compared to other parts of the County. This growth will require continual evaluation of the area's capacity to respond and recover from natural hazards as priorities are set for the enhancement of transportation, emergency services and utility infrastructure.

Hazus Analysis

Overview

Hazus MH is software developed by FEMA for estimating and visualizing losses to property and infrastructure from natural hazards such as flood, hurricane, and coastal surges. This software is provided free of charge by FEMA, and runs on the ArcGIS platform. In January 2015 a new version was released including updated building and census data, which LCOG obtained to provide the following analysis.

Hazus analysis can be considered as a rough sketch of the potential outcome from a major disaster, identifying patterns and problem areas, and establishing the general scope of anticipated damages. There is a significant amount of basic structure and infrastructure data available from the program. These data are based on a combination of decennial census data from (2010) and information provided by the Dun and Bradstreet Corporation (Arlington, Virginia). Also included in Hazus are dollar replacement values for various classifications of buildings. Taking these factors into account, the regional inventory of total value by building category will differ somewhat from current assessment data provided by the County.

Building Inventory

Table 3-14: Distribution of Structures by General Construction Type Hazus 2015

	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	3,643	441	40	227	372	4,723
Bluffton	4,303	413	9	114	647	5,486
Hilton Head Island	17,271	2,067	119	597	825	20,879
Port Royal	2,066	265	61	114	341	2,847
Unincorporated	30,903	2,854	56	678	7,261	41,752
Total	58,186	6,040	285	1,730	9,446	75,687

Source: Hazus MH

Table 3-15: Replacement Values by General Construction Type Hazus 2015

	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$951,243,000	$295,070,000	$109,560,000	$232,481,000	$17,182,000	$1,605,536,000
Bluffton	$1,178,098,000	$194,180,000	$27,066,000	$112,097,000	$30,090,000	$1,541,531,000
Hilton Head Island	$6,294,653,000	$1,334,854,000	$223,456,000	$581,449,000	$37,766,000	$8,472,178,000
Port Royal	$570,933,000	$274,800,000	$207,036,000	$164,354,000	$15,301,000	$1,232,424,000
Unincorporated	$8,300,384,000	$1,138,263,000	$128,735,000	$458,490,000	$331,329,000	$10,357,201,000
Total	$17,295,311,000	$3,237,167,000	$695,853,000	$1,548,871,000	$431,668,000	$23,208,870,000

Source: Hazus MH

2015 HAZUS Information

Wind

Having investigated the different wind hazard issues of concern in Beaufort County, a series of analyses designed to assess current, relative vulnerability of structures in the County to high wind hazards was performed. Tropical storms and hurricanes were the types of events considered most probable to have a widespread effect on the County.

Damage Functions

The wind vulnerability of structures is dependent on several factors including:

- structure location particularly coastal vs. inland areas,
- building type
- quality of materials and construction,
- structure exposure and height,
- beneficial or adverse effects of nearby trees and structures,
- age and condition, and
- degree of rainfall or water penetration.

For this analysis, a simplified approach is used by which the factors considered are structure location and general building type. This approach will provide simplified results with an appropriate level of detail for this study. Furthermore, review of post-hurricane damage reports such as Mehta, et al. (1981) show that structural damages typically correlate well with structure type and degree of engineering attention.

Beaufort County's most inland area is approximately 35-40 miles from the Atlantic Coast. Therefore, a constant wind speed for the County was considered in evaluating wind vulnerability.

Wind Assessment Scenarios

Using replacement values for structures provided in the software, five wind scenarios were considered ranging from a tropical storm to a category 4 hurricane. In comparison to the scenario that will be presented demonstrating combined flood and wind damage which uses a defined hurricane path, the wind model assumes that wind speeds will be distributed evenly throughout the county. However, due to varying proximity to the shoreline, locations experience wind damage at different rates with those closer to the shore incurring greater losses. The following table demonstrates economic losses experienced by the incorporated and unincorporated areas of Beaufort County for each of the five scenarios. This data is also grouped by building type. The economic losses presented in the table include not only the damage to the building but also lost contents, personal and rental income, and relocation costs.

Table 3-16: Estimated Economic Losses by Wind Event

Tropical Storm						
	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$139,000	$7,000	$0	$1,000	$3,000	$150,000
Bluffton	$23,000	$1,000	$0	$0	$4,000	$28,000
Hilton Head Island	$349,000	$9,000	$0	$0	$6,000	$364,000
Port Royal	$62,000	$4,000	$0	$0	$3,000	$69,000
Unincorporated	$1,203,000	$72,000	$0	$3,000	$79,000	$1,357,000
Total	$1,776,000	$93,000	$0	$4,000	$95,000	$1,968,000
Category 1						
	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$16,320,000	$2,846,000	$464,000	$1,787,000	$254,000	$21,671,000
Bluffton	$7,563,000	$703,000	$33,000	$257,000	$227,000	$8,783,000
Hilton Head Island	$79,211,000	$1,261,000	$551,000	$1,757,000	$439,000	$83,219,000
Port Royal	$9,486,000	$2,310,000	$630,000	$1,120,000	$207,000	$13,753,000
Unincorporated	$102,092,000	$9,883,000	$429,000	$2,104,000	$5,182,000	$119,690,000
Total	$214,672,000	$17,003,000	$2,107,000	$7,025,000	$6,309,000	$247,116,000
Category 2						
	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$28,752,000	$5,868,000	$1,081,000	$4,458,000	$462,000	$40,621,000
Bluffton	$34,368,000	$4,163,000	$347,000	$2,500,000	$962,000	$42,340,000
Hilton Head Island	$270,708,000	$47,785,000	$3,358,000	$13,234,000	$1,525,000	$336,610,000
Port Royal	$19,798,000	$6,465,000	$2,075,000	$3,816,000	$393,000	$32,547,000
Unincorporated	$252,271,000	$27,202,000	$1,607,000	$9,227,000	$9,472,000	$299,779,000
Total	$605,897,000	$91,483,000	$8,468,000	$33,235,000	$12,814,000	$751,897,000
Category 3						
	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$82,902,000	$18,760,000	$4,228,000	$18,273,000	$1,313,000	$125,476,000
Bluffton	$71,208,000	$8,915,000	$888,000	$5,934,000	$2,147,000	$89,092,000
Hilton Head Island	$760,492,000	$120,466,000	$13,183,000	$55,763,000	$5,283,000	$955,187,000
Port Royal	$55,444,000	$19,713,000	$7,633,000	$13,568,000	$1,075,000	$97,433,000
Unincorporated	$707,304,000	$73,772,000	$6,082,000	$33,119,000	$31,045,000	$851,322,000
Total	$1,677,350,000	$241,626,000	$32,014,000	$126,657,000	$40,863,000	$2,118,510,000
Category 4						
	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort	$130,562,460	$27,266,900	$5,428,520	$24,017,020	$2,171,860	$189,446,760
Bluffton	$395,706,000	$53,678,000	$7,005,000	$39,346,000	$13,135,000	$508,870,000
Hilton Head Island	$2,478,303,000	$374,982,000	$55,794,000	$235,147,000	$19,825,000	$3,164,051,000
Port Royal	$57,950,000	$21,446,000	$8,755,000	$14,760,000	$976,000	$103,887,000
Unincorporated	$1,721,095,000	$182,895,000	$16,814,000	$92,289,000	$30,708,000	$2,043,801,000
Total	$4,783,616,460	$660,267,900	$93,796,520	$405,559,020	$66,815,860	$6,010,055,760

Source: Hazus MH,

Table 3-17: Estimated County-Wide Building Damage by Wind Event (Building Count)

	No Damage	%	Minor	%	Moderate	%	Severe	%	Destruction	%	Total
TS	75,769	99.96%	28	0.04%	1	0.00%	0	0.00%	0	0.00%	75,798
CAT 1	70,663	93.23%	4,650	6.13%	460	0.61%	15	0.02%	9	0.01%	75,797
CAT 2	58,480	77.15%	14,374	18.96%	2,693	3.55%	173	0.23%	79	0.10%	75,799
CAT 3	42,636	56.25%	23,112	30.49%	8,132	10.73%	1,340	1.77%	578	0.76%	75,798
CAT 4	30,706	40.51%	21,420	28.26%	14,649	19.33%	6,039	7.97%	2,983	3.94%	75,797

In addition to the costs incurred by the residents in terms of damages to structures and contents, local governments must also be prepared to remove the debris that is left behind in a storm. In the Hazus MH software, estimates for debris from fallen trees and limbs can be projected by each category of storm. It is suggested in the Hazus user manual that estimates be multiplied by a factor of 3 to account for widespread reports that Hazus debris estimates have fallen short of the subsequent experiences of public works crews responsible for cleanup. The following table provides the Hazus MH debris estimate, multiplied by 3 for 5 categories of tropical cyclone. The issue of debris removal, its cost and continued cooperation among the jurisdictions in all four counties was raised by the members of the Steering Committee as an issue that needs more work.

Table 3-18: Estimated Tons of Debris Generated by Storm Category

	TS	CAT 1	CAT 2	CAT 3	CAT 4
Beaufort	330	8,226	12,540	18,492	16,335
Bluffton	9	4,737	15,996	22,092	46,218
Hilton Head Island	1,629	4,353	60,888	88,782	136,116
Port Royal	168	25,851	7,065	10,341	10,455
Unincorporated	2,694	62,904	112,167	172,347	200,937
Total	4,830	106,071	208,656	312,054	410,061

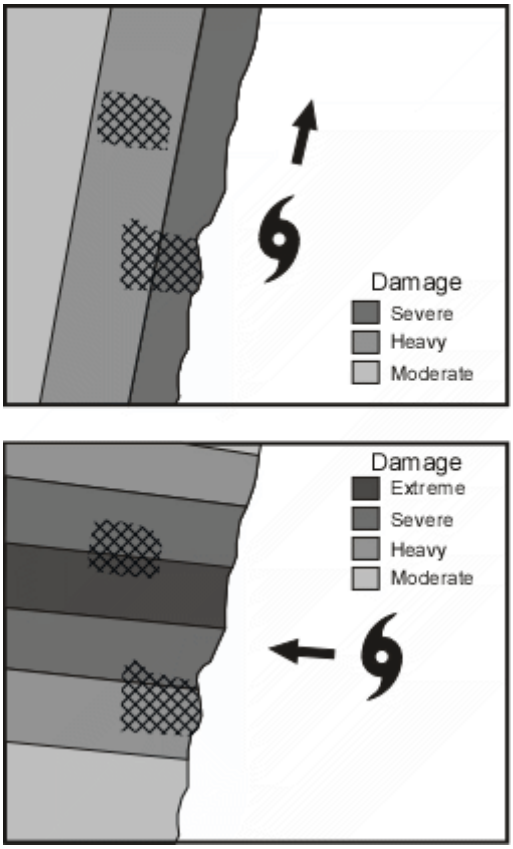
Conclusions

As is demonstrated in this analysis, the vulnerability to wind damages is distributed evenly countywide. Areas directly along the coast such as the Town of Hilton Head Island, Daufuskie Island and the St. Helena area are expected to suffer more direct wind damage from coastal storms than the other areas of the county given their proximity to the shoreline. However, the county's coastal location puts all of its communities at risk from high winds from coastal storms.

Combined Wind and Flood Damage

Modeling that incorporates the damages of coastal flooding offers a more complete account of the threat of tropical cyclones. In contrast to the scenarios presented for wind which assume an equal distribution of high winds across an area, the combined wind and flood model requires that a defined hurricane path be set, with wind and flood occurring at locations according to their proximity to that path, but also incorporating topography and the shape of the coastline. As the following images indicate, the trajectory of the storm upon landfall is highly influential over the resulting patterns of damages.

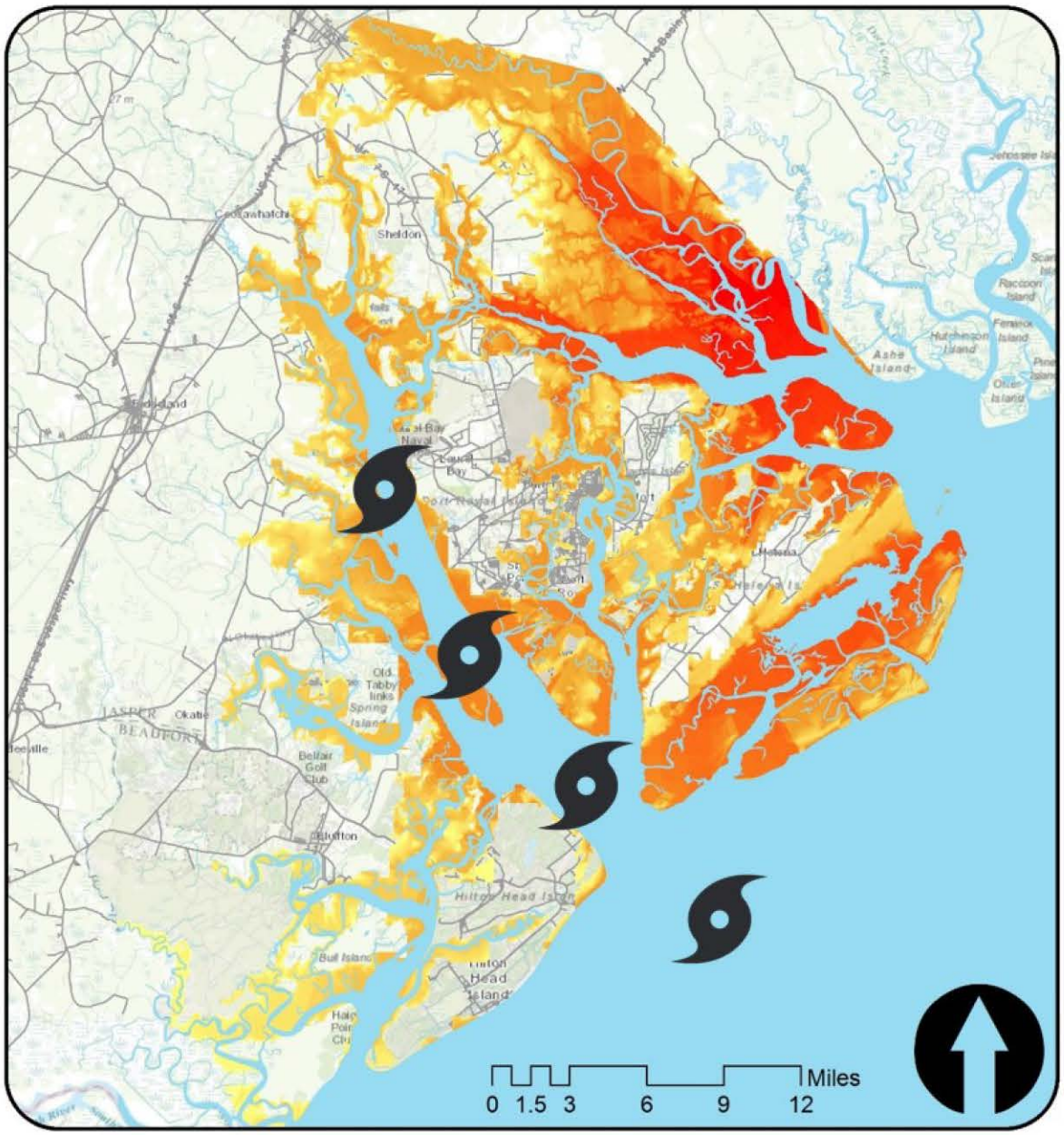
Figure 3-6: Hurricane Damage Patterns



Source: Tulane.edu

Hazus-MH allows users to create their own hurricane with customized paths and characteristics, or choose from archived historical storms. Due to its particular resonance in the memories of Lowcountry residents, staff chose Hurricane Hugo, a category 3 storm which caused widespread destruction in the area in 1989, although Beaufort County did not experience a direct hit. The coordinates for the storm were adjusted to show what would have happened if the path of the hurricane would have run along the Broad River, located centrally in the County. The following map shows the predicted storm surge which, like the preceding figures explain, is most severe to the northeast of the storm eye.

Figure 3-7: Projected Storm Surge from Hugo Model Category 3 Storm



Source: FEMA and ESRI

Storm Surge Depth
High : 25 ft
Low : 8 Ft

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Due to the limitations of the Hazus-MH software, the impacts could only be shown in terms of economic losses, as opposed to percentages of buildings damaged. In comparison to the wind scenarios [see Table 3-16] where losses included relocation costs and lost income in addition to building and contents damages, the combined wind and flood model only shows losses for the structure and its contents. The following map show total economic losses to structures and their contents by census block for Beaufort County.

Figure 3-8: Economic Losses (Building/Contents) from Hugo Model Category 3 Storm

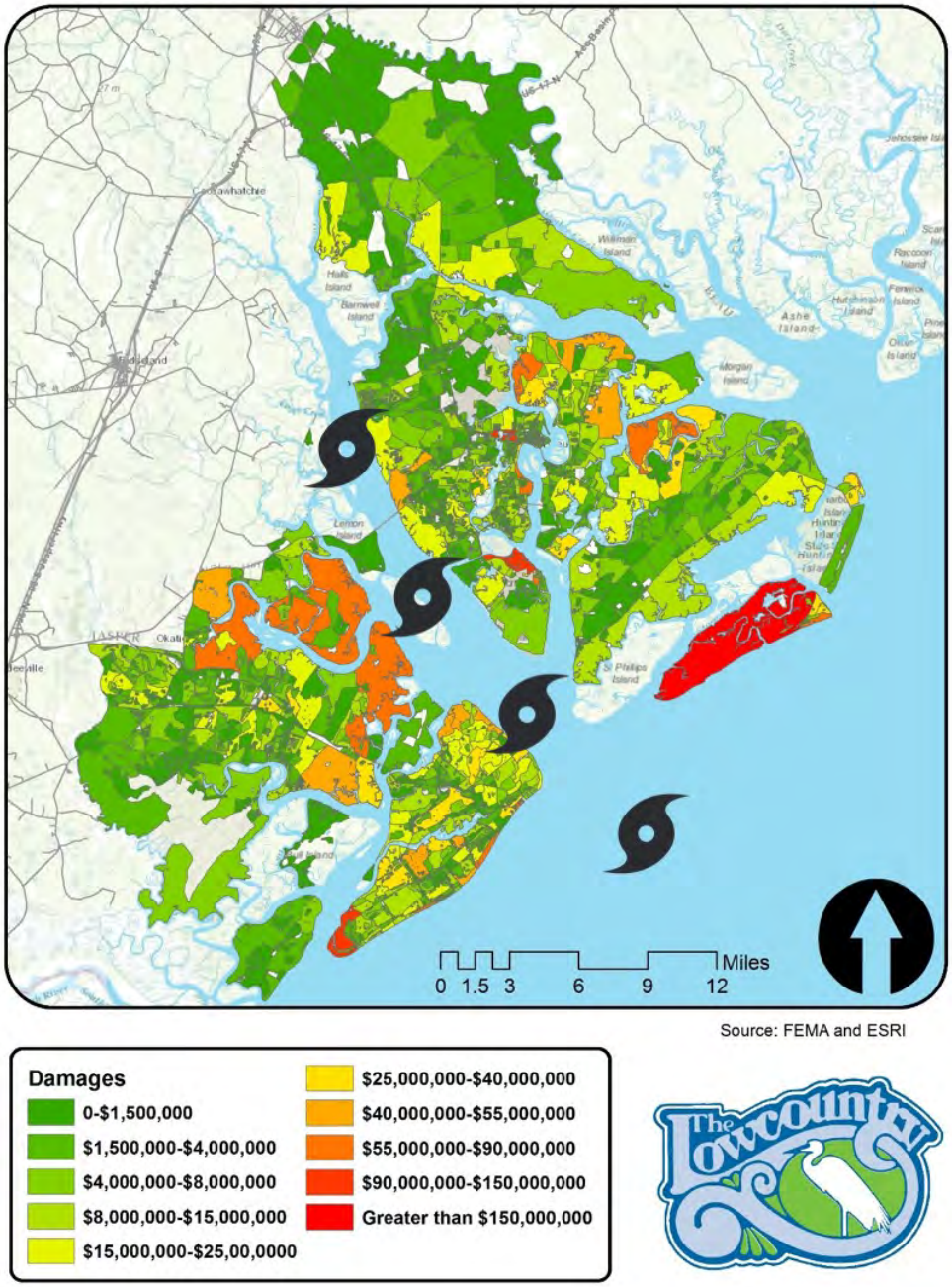


Table 3-19: Economic Losses from Category 3 Wind and Flood Scenario

	Contents and Building
Beaufort	$823,744,000
Bluffton	$261,696,000
Hilton Head Island	$2,459,845,000
Port Royal	$663,134,000
Unincorporated	$4,616,677,000
Total	$8,825,096,000

In terms of total economic losses, damages would have been distributed widely throughout the county, with areas of particular concern being Fripp Island, Dataw Island, Spring Island, Parris Island, and portions of Hilton Head Island. However, assessing damages by total economic losses may downplay the impact on areas with lower value real estate. Attempting to correct for this factor, the following maps visualize estimated damages as a percentage of the total assessed value of structures, excluding their contents, by census block.

Figure 3-9: Damage Percentage of Total Value in Wood Construction

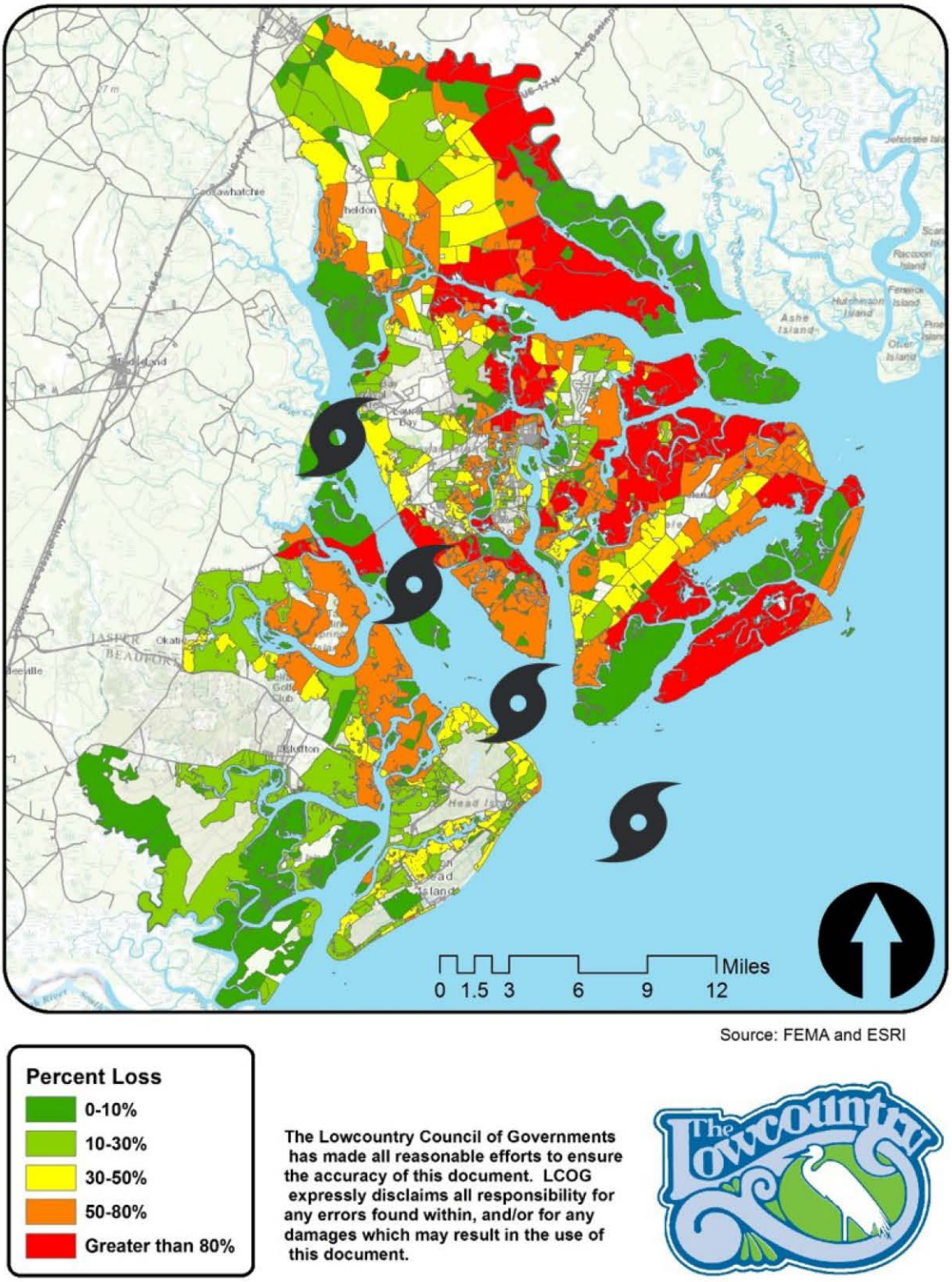
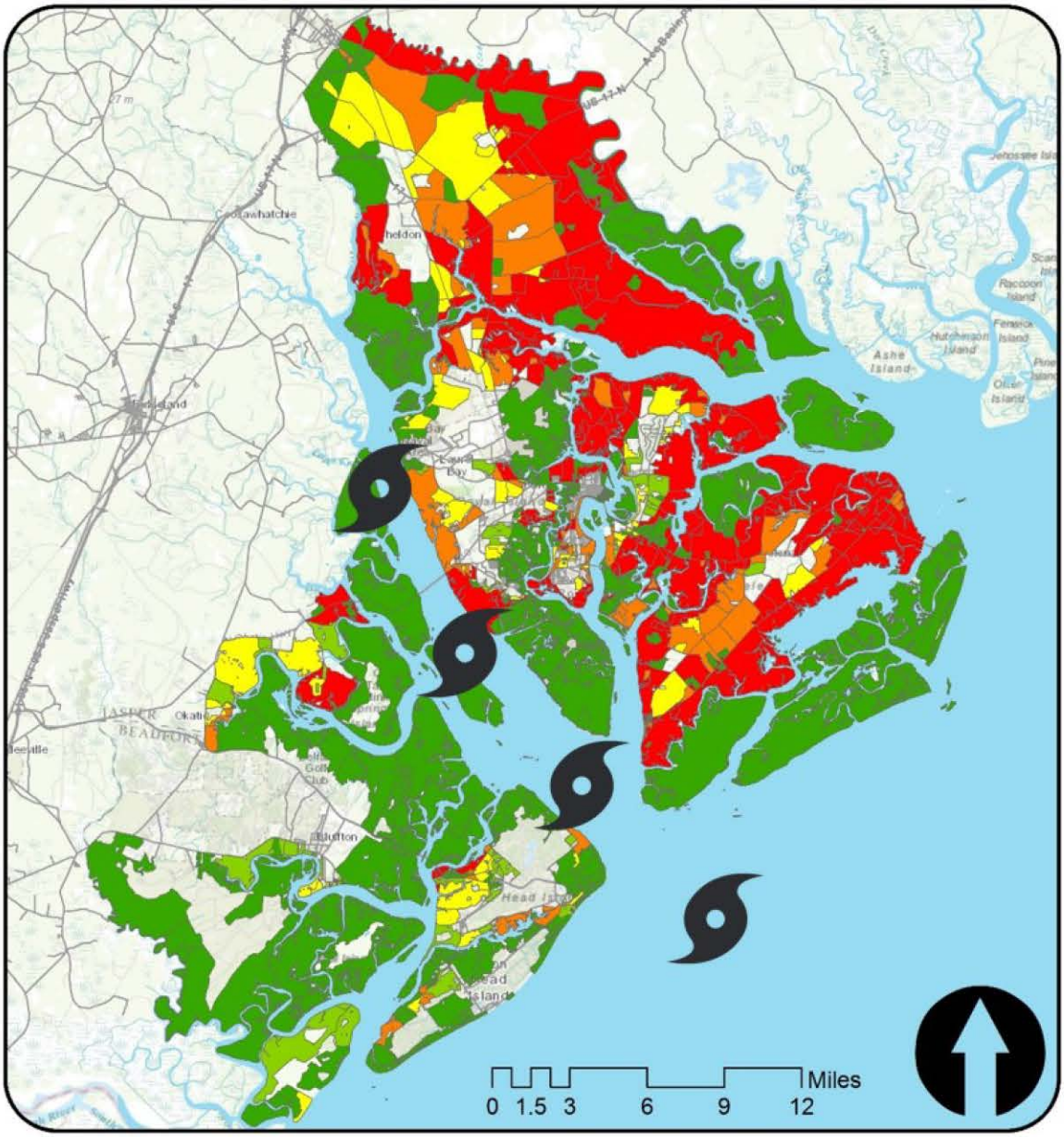


Figure 3-10: Damage Percentage of Total Value of Manufactured Housing



Source: FEMA and ESRI

Percent Loss

- 0-10%
- 10-30%
- 30-50%
- 50-80%
- Greater than 80%

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As is evident in the preceding maps, analyzing economic losses as a percentage of total value presents a significantly different view of the area's vulnerability to wind and flood losses. While areas identified in the overall economic losses map such as Fripp, Spring Island, and Dataw remain concerns, areas in Northern Beaufort County, particularly St. Helena's Island, Lady's Island, and large areas north of the Coosaw River incur significant structural losses.

Conclusion

Incorporating the threat of coastal surges into a hurricane model provides significantly larger estimates of damages than calculating for wind alone. The combined wind and surge model, due to its greater sophistication in accounting for shoreline characteristics, provides insight into where the greatest damage might occur in the County depending on the location of landfall. .

Earthquake

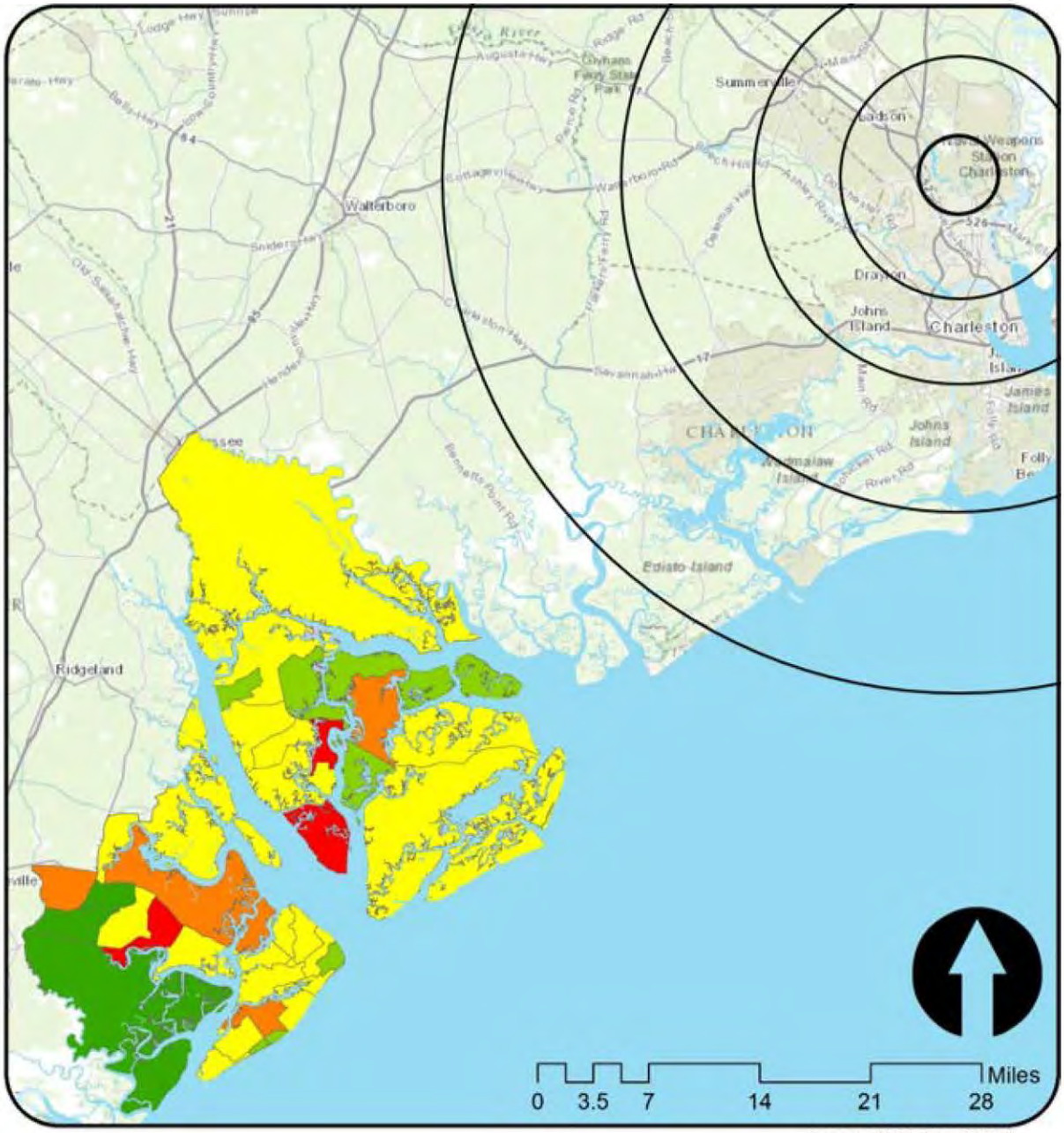
Beaufort County experienced one micro earthquake with the epicenter at Hilton Head in 1989, but it is in the vicinity of more active fault lines in the Charleston area. Hazus allows users to define both the epicenter and magnitude to provide a range of possible earthquake scenarios. Given that these more active faults pose a greater risk than earthquakes originating in the County, the following analysis models the Charleston earthquake of 1886, a 6.9 magnitude quake that caused structural damage as far away as Ohio and Virginia.

Table 3-20: Dollars in Structural Damage

	Wood	Masonry	Concrete	Steel	Manufactured	Total
Beaufort County	$32,729,000	$31,711,000	$11,160,000	$30,993,000	$12,600,000	$119,193,000
Percent of Total Value	0.2%	1.0%	1.6%	2.0%	2.9%	0.5%

The model shows that damage from a major earthquake originating in Charleston is widespread. Cumulatively, there is a tremendous impact in terms of overall structural losses nearing 120 million dollars. Manufactured housing is damaged more completely than other construction types, in terms of the percentage of the total value lost. Referring to the following maps, northern Beaufort County sees greater damage to mobile homes partly due to the proximity to the epicenter, but also for the concentration of this type of construction.

Figure 3-11: Total Structural Losses from 6.9 Charleston Earthquake by Census Tract



Source: NOAA and ESRI

Structural Damage (1000's)

- 0-1000
- 1000-2000
- 2000-4000
- 4000-6000
- 6000-9000

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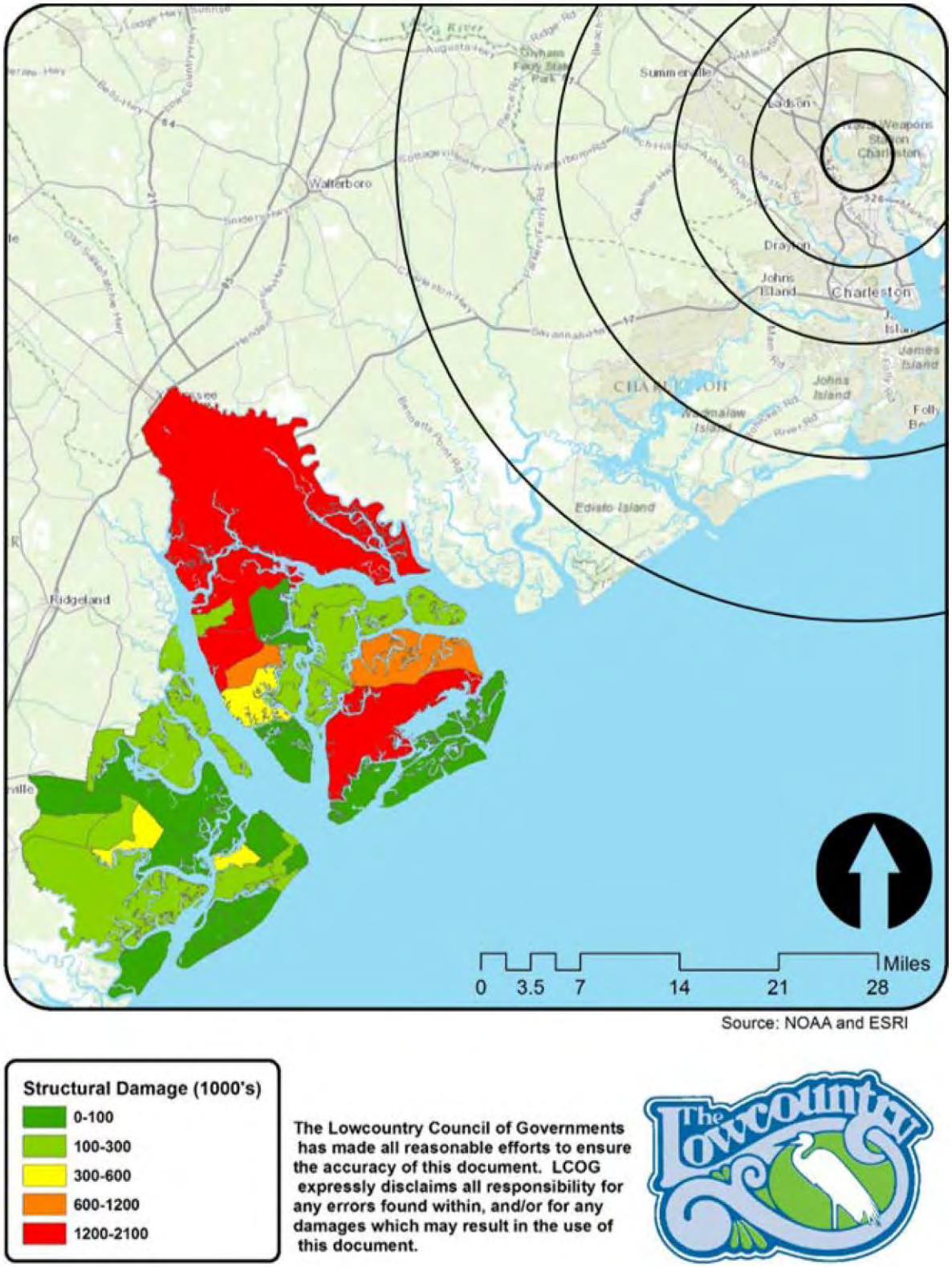
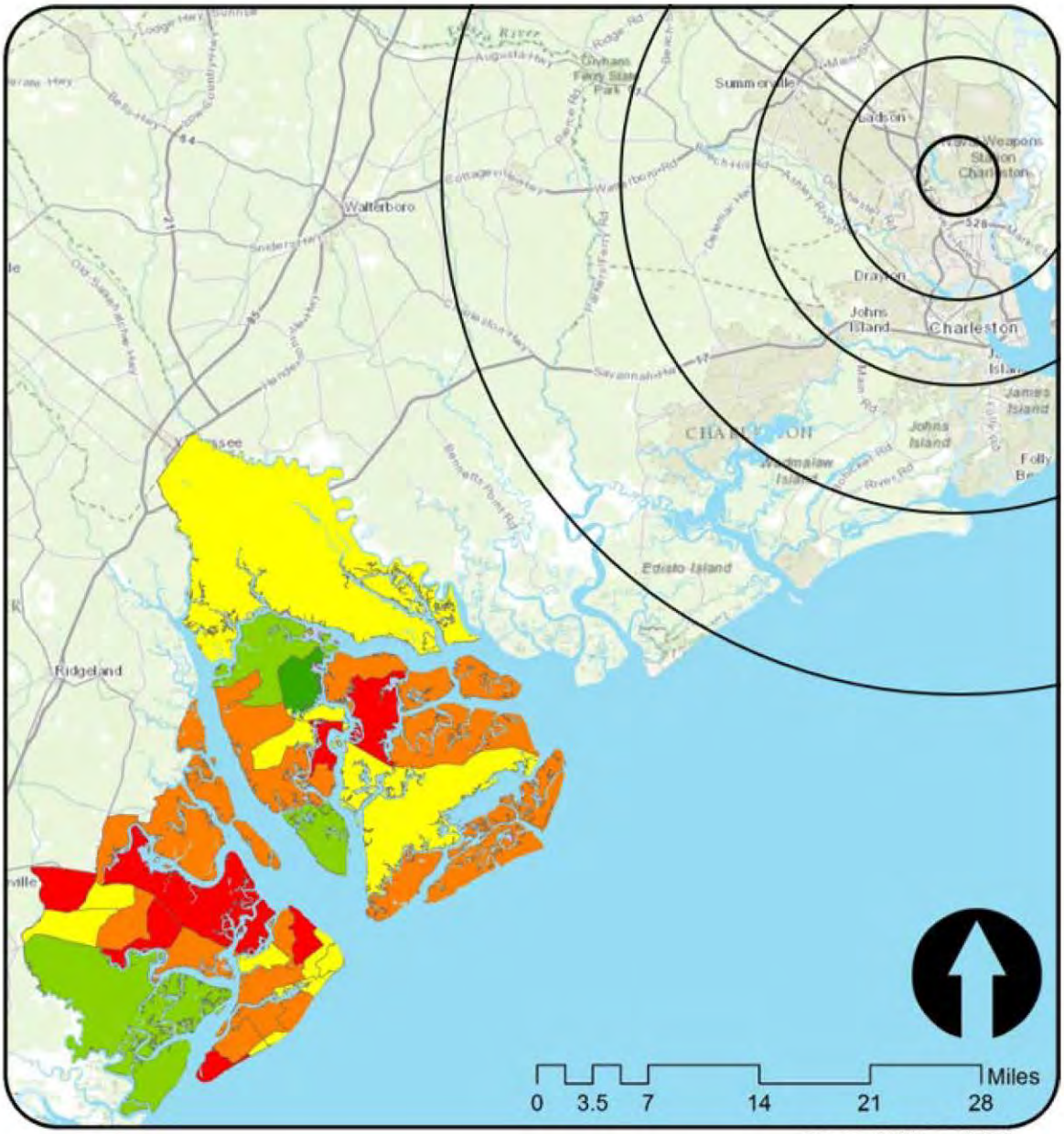
Figure 3-12: Damage to Manufactured Housing from 6.9 Magnitude Charleston Earthquake



The Lowcountry Council of Governments has made all reasonable efforts to ensure the accuracy of this document. LCOG expressly disclaims all responsibility for any errors found within, and/or for any damages which may result in the use of this document.

Figure 3-13: Damage to Wood Construction from 6.9 Magnitude Charleston Earthquake



Source: NOAA and ESRI

Structural Damage (1000's)

- 0-100
- 100-300
- 300-600
- 600-1200
- 1200-2400

The Lowcountry Council of Governments has made all reasonable efforts to ensure the accuracy of this document. LCOG expressly disclaims all responsibility for any errors found within, and/or for any damages which may result in the use of this document.

Conclusions

Vulnerability to earthquakes for the communities within Beaufort County is based largely on their proximity to areas with a history of seismic activity, as well as the distribution of building types within each of the communities. According to the Hazus model, southern Beaufort County, despite being further from the epicenter of a Charleston earthquake, would record structural losses exceeding those census tracts in the north of the county. These results are attributable to concentrations of population and higher value construction in these areas. Taking these factors into account, the potential for losses from earthquakes, while small in comparison to a major hurricane, are nevertheless sufficient to warrant serious consideration in terms of hazard mitigation and recovery.

4. Community Mitigation Capability Assessment

Thus far, the planning process has identified and updated the natural hazards posing a threat to Beaufort County, and described and quantified the vulnerability of the County and its communities to these risks using updated information from FEMA and the local jurisdictions. Next, the "Community Mitigation Capability Assessment" was completed prior to finalizing updated Goals and Objectives for improving each jurisdiction's ability to reduce the impacts of these risks. The Capability Assessment reviewed and updated the roster of mechanisms that exist already to reduce hazard damage.

LCOG staff took two approaches in conducting this assessment. First, a review of the previous plans inventory of existing policies, regulations and plans was made. These policy and planning documents were collected and reviewed to determine if they contributed to reducing hazard related losses, or if they inadvertently contributed to increasing such losses. Second, an inventory of other mitigation activities was made through the use of a matrix. The purpose for this effort was to identify activities and actions beyond policies, regulations and plans that were either in place, needed improvement, or could be undertaken, if deemed appropriate. Throughout the process there was frequent consultation with the representatives of the jurisdictions to discuss and clarify the issues. When the assessment was completed, the Committee reviewed the results and made further recommendations that were incorporated.

Table 4-1, on the following page, outlines the documents that were reviewed.

Table 4-1. Beaufort County Documents used for Capability Assessment

BEAUFORT COUNTY	CITY OF BEAUFORT	TOWN OF BLUFFTON	TOWN OF HILTON HEAD ISLAND	TOWN OF PORT ROYAL
Comprehensive Plan	Comprehensive Plan	Comprehensive Plan	Comprehensive Plan,	Comprehensive Plan
Beaufort County Community Development Code				Subdivision Regulations
Northern,Southern Beaufort County Plan	Unified Development Ordinance	Unified Development Ordinance	Land Management Ordinance	Zoning Regulations and Map
Daufuskie Island Plan				Flood Damage Prevention Ordinance
Stormwater Master Plan	Historic Preservation Plan		Local Beach Management Plan	
Northern Beaufort County Plan		May River Watershed Action Plan		Overlay District Standards,
Stormwater BMP Manual	Stormwater BMP Manual	Stormwater BMP Manual	Stormwater BMP Manual	Stormwater BMP Manual
All ICC Building codes without amendments	All ICC Building codes without amendments	All ICC Building codes without amendments	All ICC Building codes without amendments	All ICC Building codes without amendments
Beaufort County Disaster Recovery Plan				
Emergency Operations Plan				
Beaufort County Regional Stormwater Quality BMP Retrofit Project			Island-Wide Drainage Study	

Below is a bulleted summary of how each of these documents contributes to an overall Hazard Mitigation framework. Each point identifies where and how mitigation concepts, principles and measures are integrated into the normal day-to-day activities of the local governments. Text that is highlighted ***in bold italic*** identifies opportunities to strengthen or improve activities to reduce future hazard-related losses further.

Beaufort County:

Northern Beaufort County Plan, 2007

- This document presents policies and strategies for growth management, and the preservation of natural resources. Baseline standards are recommended for consistency between jurisdictions addressing marshes, freshwater wetlands, coastal waters and shorelines.

- In planning for adequate facilities to accommodate future growth, hurricane evacuation is highlighted as a key factor.

- Recommended natural resource protections include standard vegetative buffers for waterfronts, limits on impervious surfaces, limiting residential density in rural areas and the development of TDR's and incentives to direct growth away from environmentally sensitive land.

- Open space preservation is recommended as part of a regional network, highlighting the importance of unfragmented wildlife corridors.

- ***Overall this plan could be strengthened to include a more robust treatment of natural hazards in relation to specific land use decisions and controls. This could include the delineation of flood hazard areas and their identification as a constraint to future development.***

Southern Beaufort County Plan, 2007:

- Document presents policies and strategies for growth management, a fundamental principle of coastal mitigation planning. The plan recognizes natural hazards as a constraint to growth.

- Beaufort County's vulnerability to hazards is acknowledged throughout the plan, and hurricanes appear as the area's most devastating, regularly occurring natural hazards

- The Existing Land Use Element identifies Resource Conservation Zoning Districts and Overlay Districts. These districts regulate development in flood hazard areas. The Resource Conservation Zoning District protects and conserves sensitive environmental areas, maintains open space, and discourages growth in areas which "pose undue hazards to man." The element calls for lower densities within rural and critical areas.

- The Future Land Use Element stresses preservation of certain area-wide resources. It calls for infill development in the main urban centers.

- The Natural Resources Element identifies mainland geology, sea-level changes, erosion and accretion, and drainage issues. It identifies the need for preparation for sea-level rise in the coming decades. It also recognizes the hazard Beaufort County faces, especially hurricanes and flooding. ***This plan could be strengthened by recommending enhanced building regulations to avoid loss in hazard prone areas.***

- The regulatory framework section references the relationship to OCRM regulations and development.

- The Community Facilities section identifies the Emergency Management Department. It suggests a regional evacuation plan with agreements for cooperation from the surrounding counties; protecting the major evacuation routes, and to continue coordination efforts to ensure maximum efficiency in evacuations. ***This section could be expanded to include mitigation by, for example, suggesting that new and/or expanded community facilities take hazard protection into their siting decisions (e.g., schools, wastewater, and cultural facilities). The section be expanded to identify existing critical facilities essential to preserving a minimum response capability.***

Comprehensive Plan, 2015-16:

- As of the time of the development of this update to the HMP, Beaufort County is in the process of updating the Comprehensive Plan. This plan will reference the updated HMP and will address many of the same focus areas such as facilities, land use, flood hazards and Sea Level Rise.

Comprehensive Plan, 2010:

- The Future Land Use Element

    - Emphasizes a compact urban form with the preservation of the rural character of unincorporated areas. Growth management strategies are an essential principle of hazard mitigation.

    - Identifies the goal of preserving environmentally sensitive areas such as estuarine ecosystems, critical to water quality and stormwater management.

    - Identifies the goal of a systemic approach to open space preservation, underscoring the threat of fragmentation to ecosystem function.

    - Identifies environmental standards and excellent stormwater management as key guidelines for new commercial development.

    - Identifies Resource Conservation Areas which, due to their environmentally sensitive nature, should be subject to the following restrictions: Minimal removal of existing vegetation, maintenance of 100 ft. buffers along all waterways, limiting housing units to 1 per 10 acres.

- The Natural Resources Element

    - Identifies hurricanes, coastal flooding, erosion, and earthquakes as prominent natural hazards that threaten Beaufort County.

    - Offers statistics on the recurrence of tropical storms and hurricanes and includes SLOSH maps indicating the potential location of flooding during storm events.

    - Identifies Sea Level Rise as a contributing to the County's future vulnerability to storms, flooding, erosion, and saltwater intrusion. The plan recommends that the County plan for the impacts of climate change and sea level rise in future land use planning, site plan review, and the location of infrastructure and public facilities.

    - Identifies beaches, dunes, and barriers islands as some of the first lines of defense against ocean-borne hazards. Rates of erosion and accretion on Beaufort County beaches are documented. Recommendations are made to protect and enhance dunes with vegetated buffers emphasizing native species.

    - Recommends a zero net loss management strategy for freshwater wetlands.

- Water conservation measures are addressed throughout the plan including education efforts and strategies for the use of non-potable water for irrigation of large landscaped areas such as golf courses. These efforts dovetail with recommendations to limit subsurface water withdrawal which increases the likelihood of saltwater intrusion into groundwater, a problem identified in several areas in Beaufort County.

- The Transportation Element identifies the threat of hurricanes and the necessity to consider evacuation in regional transportation planning. Since evacuations will be directed to inland locations, development and conditions outside of Beaufort County are considered in this analysis. Intelligent traffic systems are recommended and listed as a priority investment to alleviate congestion during evacuation events.

Daufuskie Island Plan 2010

- The plan identifies the preservation of undeveloped land as an overarching goal, and establishes a TDR program to direct development toward desired growth areas.

- The plan identifies ferry service as insufficient for current needs, but ***is not connected to emergency evacuation.***

- Road conditions are highlighted as an impediment to emergency services, and various recommendations are made to develop this infrastructure.

- The plan recommends Light Imprint New Urbanism as a method of handling stormwater and emphasizes non-structural methods for natural infiltration.

- The plan highlights the potential for a major expenditure of County resources to repair roads following a disaster due to the designation of Daufuskie as a CoBRA Zone, prohibiting FEMA from offering assistance for the reconstruction of roads. Making the necessary upgrades pre-disaster will save the County money in the long run.

- The plan offers that the Beaufort County EMD is responsible for preparing annual hurricane preparedness plans for the island, incorporating updated population data, and providing them to island residents.

- ***In prioritizing development and investment on Daufuskie Island, baseline data on suitability should be provided regarding natural hazards such as flooding.***

Beaufort County Community Development Code 12/2014

- The CDC is the tool to achieve the objectives of the Comprehensive Plan. The CDC addresses setbacks, buffers, wetland and natural resources protection, and drainage.

- The CDC encourages the use of Stormwater BMP's in creating recreational civic space.

- The CDC identifies the Natural Preserve Zone intended to protect environmentally sensitive areas such as wetlands from intense development.

- A Natural Resource Survey is required from all new development to identify sensitive areas or hazards.

- The CDC identifies a variety of stormwater BMP's and their applicability in various identified districts

Stormwater BMP Manual, 3/2012

- Identifies existing federal, state and county regulations.

- The document recommends policies and standards for new and existing development by which County aggressively pursues the issue of water quality.
    - Wetland protection and buffer requirements
    - Predevelopment standards for stormwater runoff
    - Stormwater detention for irrigation
- Water quality and bacteria data is gathered under this plan.
- Provides detailed technical information on a variety of innovative stormwater management techniques.
    - Green Roofs
    - Rain Gardens

Stormwater Master Plan 2006

- Recommended regional retrofits to improve water quality in 8 basins.
- The stormwater levels of service are designed according to the following standards:
    - Evacuation routes passable for a 100-year storm
    - Other roads passable for the 25-year storm
- The Plan identifies 130 road segments where overtopping would occur in either a 25-year or 100 year storm.
- The Plan identifies the need for future study of the secondary storm water management system, indicating that data is incomplete or outdated.
- ***As this plan identifies, Beaufort County GIS records do not have complete data on structure locations with first floor elevations and construction typology to demonstrate how buildings would be affected by inundation. A recommendation follows that databases be developed with this information for specific structures.***

Beaufort County Regional Stormwater Quality BMP Retrofit Project 2011

- This report describes a feasibility study which investigated costs and established priority among the major projects identified in the 2006 Stormwater Plan.

Beaufort County Disaster Recovery Plan 2011

- The plan describes expanded agreements between the county and municipalities in debris management, disaster impact assessment, and hazard mitigation.
- The plan highlights a new Disaster Impact Assessment Agreement between the counties and municipalities, with new software and training available to all signers.
- Beaufort County participated in the FEMA Emergency Management Institute training program.
- Following a disaster, the Beaufort County Disaster Recovery Director will take on the role of Hazard Mitigation Administrator. This individual will be responsible for following up on the plan recommendations, tracking reimbursement requests, grant administration, and organizing meetings of the Hazard Mitigation Planning Committee.
- The plan identifies that the American Red Cross and DHEC will not accept individuals with more serious medical conditions into special needs shelters and that a need exists to explore who will perform this service.

Emergency Operations Plan

- The County Hazard Mitigation Plan is appended to this plan.
- The plan establishes a Mitigation Committee with listed responsibilities, and describes Pre- and Post-disaster actions.
- Attachments A to Appendix H describe 6 continuing mitigation projects; the Storm Water Utility Comprehensive Development Plan, The NFIP/CRS, The Land Purchase Project, the Flood Alert Program, the Drainage Program, and Mitigation Education.
    - The Storm Water Utility regulates density and land-use, and establishes goals for future transportation requirements and road development.
    - The land Purchase Project is a mechanism to preserve open zones and reduce development.
    - The Flood Alert Program keeps citizens aware of potential flooding situations through cable TV and radio warnings.
    - The Drainage Program is designed to eliminate existing drainage problems and provide drainage where it is nonexistent.
    - The Mitigation Education Project is a combined effort between the County Building Codes and Emergency Management Departments to teach citizens about potential hazards in order to reduce potential damage.

Other

- The County pursues Open Space preservation through its ZDSO, and a Rural and Critical Land Preservation Program (R&CLP) which is a voluntary program which provides the means for private landowners to permanently preserve or maintain the rural character of their land. The main goal of the program is to preserve open space, protect critical and natural resources and preserve rural uses. Funds available for the program can be leveraged with federal, state, local, or private conservation efforts and development rights purchase funds to protect property and purchase development rights.

City of Beaufort:

Comprehensive Plan, 2009 revision

- The basic purpose of the land use plan is to provide direction for managing anticipated growth and change. Growth in the City however, has been slow compared to other parts of the County. There has been very little growth within the City limits in the last thirty years, as the population has increased at a relatively low rate.

- The plan's natural resources element identifies several critical geologic features. First, there are basically two types of soils: soils generally associated with the locations of wetland areas, and soils associate with areas of stable ground. The wetland areas are rarely suitable for any type of development. Second, the highest elevations in the city are approximately 20 feet above MSL.

- The climate section describes the potential for devastating hurricanes, citing 60 tropical cyclones that passed within 75 nautical miles of the County's barrier islands from 1886-1993. According to the plan, hurricane force storms are expected approximately every 11 years.

- Beaufort's main water supply comes by pipe from the Savannah River. The City's back-up supply comes from wells that tap the Florida Aquifer. The plan states that the aquifer will not be a reliable source in the future due to overuse.

- The document discusses river corridors and floodplains***. This document could be improved with a map and discussion of the NFIP development regulations in connection with the map. This would create a nexus between existing and proposed development and the hazards associated with floodplains, and the benefits of river corridors.***

- Historic resources are described in depth in a separate element. The proposed policies promote the renovation and preservation of the Historic District and buildings. There is a Historic Preservationist working in the County, and the Beaufort Preservation Manual and Supplement have been developed to assist owners of historic structures. Included as recommendations of this Hazard Mitigation Plan, is the development of specific guidance to assist owners with damage assessment and repair and reconstruction in a post-disaster situation.

- The Housing Element describes how single family housing represents the largest percentage of buildings in the County, and points out that this is somewhat skewed by the resort development of multi-family housing in other areas of the county. Additionally, the plan states that there continues to be a significant surge in housing development occurring along the waterfront and marshland. ***The housing element could be improved by creating a nexus between the proposed housing goals and the maintenance and creation of safe, disaster-resistant housing.***

- The Facilities Element speaks to transportation (roads, bridges, bicycle paths), water and wastewater treatment, police and fire, health and medical facilities, parks and recreation, and public education (schools and libraries). The Fire Department maintains an ISO (Insurance Services Organization) Class 2 for fire, and 3 for codes enforcement. These ISO classes are the same type of rating system that ISO applies to the CRS program of the NFIP. The ratings range from 1 to 10; the lower the rating, the better the measurement of community performance (and the lower the rate applied towards that component of insurance cost). Thus, the City does a commendable job in maintaining its capability for fire defense and code enforcement. ***The Facilities Element could be improved by including a list of critical community facilities and describing the need for protection of these facilities.***

- The Land Use Element provides a 20-year concept for future land use, and it strives to inventory future development. It defines future densities, ***but this could be improved by creating a connection between the future development densities and the developable soils (and thus the reduction of potential storm and flood damage).***

- The Land Use strategies propose establishing criteria for a redevelopment policy within the city, aimed at historic structures and the Board of Architectural Review. ***This could be strengthened by establishing and adopting redevelopment policies and procedures for post-disaster redevelopment, regardless of where it is located.***

- Modifications to the existing Zoning Ordinance are made, with particular reference to adopting a Tree Preservation Ordinance. ***By including a "maintenance" provision in the proposed ordinance, the City would help to reduce the exposure to the high degree of damage and power losses created by breaking, falling, and uprooted trees during severe storms. A maintenance provision would ensure that trimming tree limbs away from power lines would take place on a routine basis, thus eliminating a major factor in incurring power losses. Such a provision can also strengthen the***

concept keeping new plantings a set distance away from power lines, and only planting vegetation with root systems appropriate to the local environment.

- The Short-term Work Program in the Implementation Section recommends preparation of a Coastal Zone Management Plan as well as the preparation and implementation of a Stormwater Drainage Plan including the feasibility of developing a Stormwater Utility. ***Storm damage reduction and property protection are additional benefits of these plans that should be mentioned. Drainage plans not only address existing drainage problems, but also establish standards for new development so as not to exacerbate the existing problem any further, thus reducing damage to infrastructure and property. Stormwater Utilities can provide a dedicated ongoing source of funding that can pay for maintenance, new construction, and public education.***

Unified Development Ordinance, 2006

- The document includes all of the City Ordinances. ***The Floodplain Management Ordinance (Flood Damage Prevention Ordinance) required for participation in the NFIP should be included.***

- Article 7 Deals with nonresidential signs. ***This section could be strengthened because it dictates the size and types of signs that can be erected and signs suffer and cause significant damage during windstorms. By restricting large, flat signs, and canopies, such as those frequently found at fueling service stations, certain frequent damages can be reduced. Additionally, collateral damage is often caused by flying debris in severe wind storms, so it is important to dictate how to securely attach signs that are permitted. (Building Code contains requirements for fastening/ attachments.)***

- The UDO references non-conforming buildings or uses. Zoning regulations require structures damaged greater than 50% of their pre-damage appraisal be removed and replaced with conforming buildings and uses.

- Article 3 requires drainage facilities as part of the review criteria for subdivision of land.

- The UDO requires underground utilities in new developments.

- The document details requirements on the size and type of vegetated buffers required around critical areas and other OCRM standards.

- The UDO outlines required street improvements, drainage requirements and encourages the use of the most up-to-date and innovative drainage techniques.

- Section 7.30 allows for emergency removal of storm-damaged trees (and allows trimming around utility lines, and sometimes requires trees to be replaced). ***Consideration should be given to requiring native species within Article C, Landscaping and Tree Conservation.***

- Regarding "Development Standard" (for the Beaufort Historical District), ***reconstruction/redevelopment standards should be considered***.

- The appendix indicates that preliminary reviews of subdivisions require that floodplains, and any other conditions affecting the site, be identified.

- The appendix requires that the location of existing culverts and drainage pipes be identified.

- The appendix allows the Planning Commission to require a topographic map at an interval deemed necessary by the Commission, if conditions peculiar to the site warrant special consideration.

- The appendix outlines requirements for final approval for subdivision of land. ***This would be an opportunity for Emergency Management/Fire Department to conduct a preliminary review for access/egress and evacuation considerations. Many communities lament that Emergency Management is not involved in the development process until after-the-fact.***

Historic Preservation Plan Update 7/2008

- The HPP includes a section for disaster planning and details the preparations being made on behalf of Beaufort's historic buildings in the event of a severe storm.

    - Photo documentation of all the historic structures in the downtown core and surrounds.

    - Post-disaster roles of planning staff and Historic District Review are established.

    - Allows for emergency stabilization of buildings without board approval.

    - Established guidelines for maintaining and storing salvaged artifacts.

    - Identifies the need for improved drainage in Historic Districts, and recommends the use of pervious pavers generally to mitigate stormwater.

- ***The plan could be strengthened by assessing the vulnerability of specific structures or areas according to hazard data, establishing priorities for buildings that need retrofitting.***

Town of Bluffton:

Comprehensive Plan, 2007:

- Since 1998, the town limits of Bluffton have increased from one square mile to approximately 54.24 square miles.
- In the Natural Resources Element, floodplains and floodways are defined and addressed as areas where development and variances to floodplain development should be prohibited.
- The plan identifies and acknowledges the vast amount of wetlands within the Town and surrounding areas and the need to protect those systems.
- The Town requires all development to comply with the latest version of their Stormwater Ordinance and Best Management Practices.
- The plan recommends review of ordinances and practices to ensure compliance with FEMA and National Flood Insurance programs.
- Water quality protection for the all watersheds is a priority with the Town of Bluffton with immediate attention being dedicated to the May River. The Town is currently developing the May River Action Plan to ensure a sustainable and protected watershed is maintained both now and in the future.
- Scenic River status for the New and May Rivers is recommended.
- The plan recommends reducing parking requirements, street widths, and driveway widths or imposing a maximum impervious surface percentage to help control increased surface runoff.
- Retaining or installing natural buffers along waterways and wetlands is recommended to reduce the potential for pollution from surface runoff.
- Open ditches and grass-lined swales are preferred to concrete lined or piped drainage ways and the plan states that the maintenance of the systems needs to be routine. Additionally, it notes that care must be taken to balance the designs to move stormwater quickly from potential flood locations while preserving water quality.
- ***Plan states that the Old Town's drainage system needs to be upgraded.***
- Through development agreements, all new development in the Town's newly annexed areas will have proper supporting infrastructure i.e. BJSWA (water and

sewer – no septic systems), stormwater BMPs, and roadways that meet County and SCDOT standards.

Comprehensive Plan 5-year Audit 5/2014

- The Natural Resources Element
  - Provides data on historical hazards occurring in Bluffton.
  - Watersheds are indicated as the key unit of analysis for ecological health and stormwater management.
  - Adoption of a wetlands protection ordinance based on national standards is recommended
  - The plan recommends that staff achieve certification for floodplain management.
- The Community Facilities Element
  - Recommends partnerships with neighboring jurisdictions for reciprocating services in the event of an emergency.
  - Suggests that a survey of existing stormwater systems is needed to determine their effectiveness.
  - Recommends additional facilities for emergency personnel, including maintenance operations south of the Broad and substations more widely distributed throughout the community.
  - The plan references the County's HMP process, and recommends further involvement by the town of Bluffton.
  - Recommends developing a list of critical facilities requiring retrofits for hazard resistance and applying for FEMA Pre-Disaster Mitigation Funding of the top priority structures.
  - Details efforts to finalize an emergency operations plan

Stormwater BMP Manual, 2011.

- The Town is currently represented on the Stormwater Utility Advisory Board.
- The manual compiles federal, state, and Town regulations into one document thereby simplifying the process of stormwater treatment and mitigation.

- The manual regulates the post-development peak runoff discharge to pre-development runoff rates for the 2-,10-, and 25-year storm events.

- The 100-year storm event must be accommodated in the plan.

- The storm drainage system must be adaptable to future expansion with minimum additional cost and designed to accommodate build-out conditions in the upstream reaches of the drainage area.

- Swales and natural flow features are encouraged to reduce the need for storm sewers.

- All projects shall have in-series BMPs and all stormwater management system designs shall contain at a minimum one wet detention BMP, one vegetative BMP and one filter or infiltration based BMP. Projects shall be designed to include a minimum of three BMPs in-series to meet the requirements set forth in the Stormwater Management Ordinance.

- One hundred percent of all parking spaces above the required amount identified in the Unified Development Ordinance shall be constructed of permeable surfaces.

May River Watershed Action Plan 2011

- The focus of the Action Plan is centered on promotion of Low Impact Development (LID) and runoff reducing techniques, incentives to encourage stormwater runoff volume reduction, and coordination with developers and property owners to promote the Town's Transfer of Development Rights (TDR) Program, incentives, and conservation easements.

- The plan includes a pervious/impervious surface study for the area.

- The plan assesses existing Town and regional documents relating to stormwater management practices, and recommends additional measures not included:

    - Require a maximum time of land disturbance for new development without specific milestones being met, such as percent stabilization (i.e., provide a temporal limitation so areas are not clear-cut and then sit inactive for an indeterminate amount of time).

    - To reduce pollutant loadings to streams the most utilized option is to provide appropriate detention/retention prior to runoff entering the stream. However, a secondary option to reduce pollutant loadings to streams is to reduce overall initial runoff from developments (i.e. pervious pavements, median depressions, rainwater gardens, etc). Therefore, there is potential for the Town to provide additional design information in the stormwater manual, which will

provide options for runoff reduction, as opposed to a main focus on retention/detention.

- The plan recommends the development of a land acquisition strategy for future stormwater projects.
- The second phase of the project used LiDAR to determine flow paths and sub-basin boundaries. Using elevation data from LiDAR and engineering experience and judgment, sub-basins and flow paths were created.
- The Action Plan recommends regional retrofits and BMP's in the form of:
  - Regional stormwater ponds
  - Wetland restoration
- For existing public facilities the following are suggested:
  - Rain gardens
  - Vegetated Swales
  - Rain barrels and cisterns
  - Pervious Pavement

Unified Development Ordinance

- The subdivision review application requires identification of floodplains, topography, wetland, waterways, trees, drainage ditches, etc.
- Subdivision plans must be approved by each of the following entities: the County Engineer, the Town Engineer, the Fire Marshall, SCDOT, BJWSA, EMS Addressing, and other utilities.
- Conservation and Flood Hazard Districts are defined with special standards applied in conjunction with NFIP.
- The ordinance contains the Preserve District, which may be used to protect environmentally sensitive areas from development.
- PUD applications must demonstrate benefit to the Town of Bluffton including preservation and enhancement of natural features and open space.

- Development adjacent to wetlands and riparian areas is subject to the Town's development standards in addition what is required by DHEC and the OCRM pertaining to maximum site disturbance and required buffer yards.

- Waterfront properties with less than 75 ft. of frontage are required to share a dock with adjacent properties.

- Stormwater standards hold new development to pre-development hydrological conditions through non-structural and structural BMP's.

- Continued yearly monitoring of stormwater systems is required to ensure proper function.

- Irrigation systems must first use retained stormwater before accessing ground or potable water sources. Irrigation must not be placed within 50ft of a natural stream.

- The UDO provides incentives for development to provide permeable pavement, stormwater collection and reuse, additional wetland buffers, and wetland restoration.

Town of Hilton Head Island:

Comprehensive Plan, 2010

- The Comprehensive Plan includes the Beaufort County Multi-jurisdictional Hazard Mitigation Plan as an Appendix. Additional Appendices include:

    - Post-Disaster Recovery & Mitigation Plan

    - Beach Management Plan

    - Island-wide Drainage Study

    - Fire and Rescue Master Plan

- The process of conducting the state mandated Comprehensive Plan update fulfilled the Town's Community Rating System (CRS) planning requirements by updating this Hazard Mitigation Plan.

- The Natural Resources Element

    - Identifies and assesses coastal resources, wetlands, floodplains, and soils among other concerns.

    - Identifies 56 percent of the Island surface as having soils that are poorly drained, and though hurricanes pose a catastrophic threat, the limited drainage

capacity of the soils, the lack of connected wetlands, and poorly maintained rural ditches cause sustained periods of rain to be the foremost threat of flooding.

- The Community Facilities Element includes an analysis of stormwater management, Fire Protection and Emergency Medical Services.

- Hazard Mitigation is promoted to minimize the vulnerability of Town infrastructure and public facilities to storm damage by including the Beaufort Multi-Jurisdictional Hazard Mitigation Plan as an integral part of the Town Comprehensive Plan.

- The Land-Use Element

    - Includes a future land-use map, and includes redevelopment strategies and policies that address pre- and post-disaster issues. The strategies are within the Town's Land Management ordinance (LMO).

    - Includes the consideration of land purchases in areas of the Island that are vulnerable to severe storms and flooding and would be prime areas for future development.

- Implementation of the Island-wide Drainage Study is identified as a critical activity, and its continued implementation is vital to the Island.

- The Town supports the use of Best Management Practices including innovative nonstructural and structural technology for the prevention and control of urban runoff.

- The Town promotes the protection of water quality, and combines those techniques to lessen drainage and flooding problems where appropriate.
- Sustainability and growth management are principles woven throughout the Comprehensive Plan.

- Maintenance of the ocean beachfront is described as a balance between tourism and the island's sensitive environment.

Local Beach Management Plan 11/2008

- Includes a section for post-disaster planning including clean-up, maintenance of essential services, and redevelopment protocol.

- The 40-year retreat policy includes the following strategies:

    - Locate development landward of the Setback line to the greatest extent possible.

- Adopt various growth management techniques and procedures to reduce development levels.
- Retain open space seaward of the Setback line to the extent possible.
- Utilize land acquisition.
- Consider retreat during redevelopment scenarios after a disaster.

- The plan describes extensive beach nourishment and dune enhancement efforts and clearly states its commitment to the existing OCRM baseline, despite the expansion of lands on the seaward side.
- The plan expresses the need to evaluate beach nourishment as its primary shoreline management technique in response to the looming threat of Sea Level Rise.
- The plan describes the wetland protection ordinance which protects both salt and freshwater wetlands. Mitigation is required onsite or in the same watershed and will be monitored for three years for effectiveness with written reports required every six months.
- The tree protection ordinance described in the plan requires replanting of native trees removed in land clearance.
- The plan contains an inventory of structures located seaward and within 50 ft. landward of the OCRM baseline.

Land Management Ordinance 10/2014

- The LMO describes the conservation zoning district designed to protect environmentally sensitive areas such as beachfront and wetlands. This district's allowed uses are restricted to structures such as boat ramps and docks.
- Two overlay districts offer additional protections from development near the shoreline.
- Wetland and natural resource protection measures are specifically identified to reduce Hilton Head's vulnerability to natural disasters such as flooding. The ordinance offers detailed requirements for wetland alteration, mitigation, revegetation, restoration, creation and preservation. Disturbance of wetlands is allowed only when all other options have been exhausted, and the plan offers recommended alternatives that can be incorporated into site plans.

- In addition to tree protection measures outlined in the plan, disturbance and clearance of understory plants is regulated through onsite inspections by the building official.

- Special procedures are set forth for the reconstruction of non-conforming structures post-disaster whereby damaged buildings can be restored to their previous state and without the necessity of a full review.

Beaufort County Hazard Mitigation Plan

- The Beaufort Multi-jurisdictional Hazard Mitigation Plan is an element of the Comprehensive Plan.

- The Town is in the top 4% of communities nationwide in floodplain management and exceed minimum NFIP requirements through the CRS program.

- The Town has a Public Information Program and an annual Flood Awareness Week

- The Town has more than 30,000 NFIP policies

- The Town has taken a proactive approach to Flood Hazard Mitigation. They developed a disaster Recovery and Mitigation Plan in 1991 following the devastation Hurricane Hugo created in South Carolina. This was one of the first Recovery Plans in the nation, and the first that defined "re-entry" following an evacuation as the beginning of recovery. In 1995, the Town recognized that while they are extremely vulnerable to hurricanes, their foremost problem with flooding was due to inadequate drainage and the frequent rainstorms typical to coastal South Carolina. This led to the development of the Town Island-Wide Drainage Study, which continues to be updated. Then, in 1999, the Town of Hilton Head Island developed their Flood Hazard Mitigation Plan. This was one of the first mitigation plans in the nation to be officially incorporated it with the Town Comprehensive Plan – a concept now embraced by the American Planning Association (APA) through their Planning Advisory Series, and FEMA, through the DMA regulations. The Town continues to enforce and update their plan, when necessary, and takes a proactive approach to flood mitigation.

- The Town is susceptible to drainage system flooding, coastal erosion, and tropical storms and hurricanes. Wind hazards present additional concerns.

- The highest priority flood mitigation issue is the coordination of new development with drainage improvements and stormwater management. This is followed by the protection of critical facilities, with an emphasis on water supply and wastewater treatment facilities.

- The Town pursues a variety of flood mitigation activities, including:

- Preventative Measures
    - Open Space Preservation
    - Storm Water Management
- Property Protection Measures
    - Building Elevation
    - Flood-proofing
    - Flood Insurance
- Natural Resources Protection
- Structural Protection
    - Beach Nourishment
    - Sand Fencing
    - Drainage Improvements
- Emergency Services

Island Wide Drainage Study, August 30, 1995

- The comprehensive study inventoried existing drainage facilities, determined major drainage paths, identified bottlenecks, and recommended prioritized improvements.
- Primary drainage problems within the Town include the changing drainage design standards over time while the island was being developed, separate systems not planned with an island-wide perspective, lack of maintenance of stormwater management facilities, and the low and flat topographic nature of the Island.
- The study notes that the Island is incapable of handling storm surges from Atlantic Ocean.
- Cleaning, dredging and maintaining the existing drainage system is the foremost priority.
- The study recommends that lagoon and ditch levels be lowered prior to major storm events.

- The study recommends that future construction require finished floor elevations to be 1 foot higher than existing lot topography and adjacent roadways.

- The study makes recommendations for improvements totaling $17.5 million, many of which have been completed.

- The drainage study is continually updated, and the staff looks for improvements and recommendations on a regular basis.

Floodplain Management and Land Management Ordinance

Floodplain Management and development policies and procedures are in good order and contribute to Hilton Head Island's commendable CRS rating of 5, which provides a significant reduction in the cost of flood insurance to policyholders, representing millions of dollars in annual savings.

OTHER:

- There are over 28,655 NFIP policies in force on HHI

- The 1999 Flood Hazard Mitigation Plan calculated damages to structures from the 100 year flood would be approximately $680 million. If HHI was not an active participant in the NFIP, it estimates that the damage would have been $1.66 billion.

- HHI has an extensive sand fencing project, aimed at preserving existing and enhancing new dunes, where they have placed over 40,000 linear feet of fencing and indigenous vegetation.

- HHI has adopted all ICC codes in full, and enforces these codes stringently.

Town of Port Royal:

Comprehensive Plan 2009

- The Natural Resources Element strives to ensure harmony between the natural and manmade environment.

    - The barrier islands that surround the Town provide some natural protection from severe weather events.

    - The highest points in Town are 20 feet above sea level.

- The Town has two types of predominant soils, eighty-five (85) percent of which can be used for development as it can accommodate septic systems. Fifteen (15) percent cannot support development.

- Within the Natural Resources Element, the following are identified as implementation strategies:

  - Implement a program to bury overhead utility lines and require new utility lines be placed underground.

  - Strengthen and enforce tree preservation ordinances.

  - Encourage the use of indigenous plants.

  - Designate areas for uses compatible with their natural functions and their potential for recreational and economic activities.

  - Recognize and protect wetlands for their capacity to filter pollutants and control flooding and erosion.

  - Employ wetland buffers and storm water BMP's to reduce contamination into marshes.

  - Budget to acquire undeveloped lands that are set aside to remain in their natural state (greenways).

  - Minimize impervious surface roadways to reduce storm water runoff.

  - Design storm water drainage systems to mimic the path of runoff in natural systems.

  - Discourage the trading or filling of wetlands by developers.

  - Develop programs to promote natural resources education, appreciation, and appropriate recreational use.

  - Create a River Overlay District.

The Comprehensive Plan could be improved simply by making mention that each of the above strategies relates to, and contributes to natural hazard mitigation or loss prevention.

- The Cultural Resources Element seeks to preserve and enhance the Town's historical integrity.

    - The Element details the 1893 hurricane that was responsible for "the loss of thousands of lives in Port Royal and the surrounding vicinity."

    - A survey is described that identified 1,506 historical sites within 1,320 properties. A County survey identifies 1,488 sites, 1,121 of which are residences. These figures substantiate the enormous percentage of Port Royal that is culturally significant and worthy of special care and protection.

- The Community Facilities Element cites the new Russell Bell Bridge as the replacement for an old drawbridge that was damaged extensively in Hurricane Hugo.

- The Land Use Element identifies the FH (Flood Hazard) zoning district (which is delineated by the community's NFIP map)

The Plan could be enhanced by adding and describing how the Floodplain Management Ordinance/Flood Hazard Zoning District prevents future flood damages.

2014 Comprehensive Plan Update

- Defines the strategy of encouraging homeowners to repair and rehabilitate historic structures. ***This strategy could be expanded to include hardening structures against flood and wind hazards.***

- The plan describes the strategy of improving stormwater management at streets and intersections that commonly flood.

- The plan recognizes the need to establish protections for freshwater wetlands.

- The plan recognizes the need for regional cooperation for open space and recommends a more explicit definition for how this is achieved.

    - The plan recommends working with other jurisdiction to establish common standards for open space in new development, and whether wetlands and stormwater detention can count toward open space requirements.

Building Regulations

- The Town uses the current IBC and International Mechanical, Fire, Fuel Gas, and Residential Codes. The Town also uses the current National Electric Code.

Town Code

- Chapter 9 of Port Royal Code is the Flood Damage Prevention Ordinance (standard). Section 9-73 requires that the Town Manager review and approve subdivision proposals and new developments to assure that:
    - They are consistent with the need to minimize flood damage.
    - Adequate drainage is provided to reduce exposure to flood hazards.
    - All proposals include flood elevation data.
    - All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.
    - New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters. On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.
    - All gas or liquid storage tanks, either located above ground or buried, shall be anchored to prevent floatation or lateral movement resulting from hydrodynamic and hydrostatic loads.
    - Critical development shall be elevated to the 500-year flood elevation or be elevated to the highest known historical flood elevation (where records are available), whichever is greater. If no data exists establishing the 500-year flood elevation or the highest known historical flood elevation, the applicant shall provide a hydrologic and hydraulic engineering analysis that generates 500-year flood elevation data.
- The Subdivision Regulations define drainage system requirements and flood hazard area requirements.
    - Storm drainage facilities shall be designed not only to handle the anticipated peak discharge from the property being subdivided, but also the anticipated increase in run-off that will occur when all property at a higher elevation in the same watershed is fully developed.
- Town code includes a tree ordinance which prohibits the clear cutting of land for the sole purpose of disposal of that land.
- The tree ordinance includes provision for tree protection and necessary approvals for the removal of trees.

- The zoning ordinance establishes the conservation preservation district which protects environmentally sensitive areas from residential, commercial, and industrial development. Allowed uses, which may include public recreation or private boat docks and marinas, may not disturb, destroy or impair the natural fauna, flora, water courses, water regimen or topography.

- The zoning ordinance sets forth procedures for the alteration, repair, and demolition of historic properties. Procedures for historic properties post-disaster could be defined.

The Local Government Capability Matrix

In addition to the assessment of community policies, regulations and plans, the Planning Team also reviewed a matrix as a way of taking inventory of additional mitigation capabilities in each community. The intent of this effort was to see if there were any similarities or gaps in community programs and tools that might indicate where some improvements could be made.

There were some key improvements that have been made since the last plan

- Jurisdictions have taken steps to protect their critical facilities as funds have become available. While not all jurisdictions have a formalized facilities protection plan outside of the hazard mitigation plan, all new construction has been built to mitigate loss, and existing buildings have in some cases been retrofitted.

- Port Royal is currently participating in the Community Rating System.

- Hilton Head has seen the reduction of repetitive loss properties from 27 to 24. Continuing diligence on issues of drainage on HHI will lead to future progress in this regard.

The matrix and the key to the matrix labels are located on the following pages. There are boxes that are shaded yellow, and others that are red. The yellow boxes highlight an opportunity to make an improvement, such as:

- Moving forward with incorporating the Hazard Mitigation Plan into all comprehensive plans should be a priority. However, all jurisdictions have expressed the desire to put the Hazard Mitigation Plan into their plan, and all plans have elements of hazard mitigation in them. Beaufort County is currently updating their comprehensive plan and will append the Hazard Mitigation Plan.

- Monitoring the reduction of the number of Repetitive Losses on Hilton Head Island.

The red boxes highlight issues that should generate a higher level of concern, and thus warrant further investigation. For example, the red highlighted boxes indicate:

- The Port Royal Town Hall demonstrates high vulnerability to flood, and is targeted in the current mitigation actions for enhancements.

Table 4-2. Capability Matrix

	Unincorporated	Beaufort City	Bluffton	Hilton Head	Port Royal
Comp Plan	Y	Y	Y	Y	Y
- with HM?		Y		Y	
Land Use Plan	Y	Y	Y	Y	Y
Subdivision Ord	Y	Y	Y	Y	Y
Zoning Ord	Y	Y	Y	Y	Y
BFM Plan	Y	N	N	Y	N
HM Plan	Y	N	N	N	N
FPM Ord	Y	Y	Y	Y	Y
- Sub.Damage?	Y	Y	Y	Y	Y
- Administrator?	Y	Y	Y	Y	Y
- # of FP Bldgs?	20,010	1,928	293	15,046	1394
- # of policies	22,877	1,510	139	28,655	399
- # of RL's?	0	0	0	24	0
CRS Rating	6	7		5	9
Stormwater Program	Y	BMP	Y	Y	BMP
Building Code	Y	Y	Y	Y	Y
Building Official.	Y	Y	Y	Y	Y
- Inspections?	Y	Y	Y	Y	Y
BCEGS Rating	3	3	4	3	6
LEOP?	Y	Y	Y	Y	Y
Warning-sirens?	Y	Y	Y	Y	Y
- NOAA W.Radio?	Y	Y	Y	Y	Y
- Cable Override?	Y	Y	Y	Y	Y
- Reverse 911?	Y	Y	Y	Y	Y
- Lead Time	72 hours Parris Island and MCAS have own sirens				
Structural Projects	Bulkhead Permits at Cherry Pt	Y		Y	Y
Property Protection	Stmwtr Util &	Detention/ Retention		Y	Y
Crit.Fac.Protection	Y	Y	Y	Y	
Water supply plan	Y	BJWSA	BJWSA	PSD	BJWSA
Nat/Cult Res. Inv.	Y	Y	Y	Y	Y
Erosion Control	Y	Y	Y	Y	Y
Sediment Control	Y	Y	Y	Y	Y
Pub. Info Prgrm	Y	Y	Y	Y	Y
Env. Ed Prgrm	Y	Y	Y	Y	Y

EXPLANATION OF CAPABILITY ASSESSMENT MATRIX

Comp Plan: Does your community have a Comprehensive Long-Term Community Growth Plan?

Land Use Plan: Does your community have a plan that designates type of Land Use desired/required?

Subdivision Ordinance: Does your community have an ordinance that dictates lot sizes, density, setbacks, construction type, etc?

Zoning Ordinance: Does your community have an ordinance that dictates type of Use and Occupancy in certain areas?

BFM Plan: Does your community have a Beachfront Management Plan, as required by SC-DHEC

HM Plan: Does your community have an existing stand-alone Hazard Mitigation Plan?

FPM Ord: Does your community have a Floodplain Management Ordinance: Directs development in identified Flood Hazard Areas.

Sub. Damage: Does your FPM Ordinance contain language on Substantial Damage/Improvements?

Administrator: Does your community have a Floodplain Administrator (someone responsible for enforcing the ordinance)?

# of FP Bldgs: How many buildings are in the floodplain in your community?

# of policies? How many buildings in the floodplain are insured against flood through the NFIP?

# of RL's: How many NFIP Repetitive Losses are in your community? (Paid > $1,000, twice in the past 10 years)

CRS Rating: Are you in the Community Rating System of the NFIP, and if so, what's your rating?

Stormwater Prgrm: Does your community have a Stormwater Management program?

Building Official: Does your community have a Building Official?

Inspections: Does your community conduct building inspections during and after completion of the development process?

BCEGS: Building Code Effectiveness Grading System Rating

LEOP: Does your community have a Local Emergency Operations Plan (a disaster RESPONSE plan)?

Warning: Do you have any type of system, such as:
Sirens? NOAA Weather Radio reception? Cable (TV) Override? "Reverse 911"? How much "lead time" is provided?

Structural Protection Projects: (levees, drainage facilities, detention/retention basins)

Property Protection Projects: (buy-outs, elevation of structures, floodproofing, small "residential" levees or berms/floodwalls)

Critical Facility Protection: (for example, protection of power substations, sewage lift stations, water-supply sources, the EOC, police/fire stations. medical facilities ... that are at risk ... e.g., in the floodplain)

Natural And Cultural Inventory: Do you have an inventory of resources, maps, or special regulations within the community? (Wetlands and historic structures/districts, etc.)

Erosion Or Sediment Control: Do you have any projects or regulations in place?

Public Information And/Or Environmental Education Program: Do you have an ongoing program even if its primary focus is not hazards? Examples would be "regular" flyers included in city utility billings, a website, or an environmental education program for kids in conjunction with Parks & Recreation?)

There are some regional capabilities that should also be considered, and an additional layer of regulations at the State and Federal Level enhance these local capabilities. The Planning Team also reviewed the following:

State Plans and Regulations

South Carolina Hazard Mitigation Plan

The update to the Beaufort County Hazard Mitigation Plan was undertaken with reference to the State Plan, itself updated in 2013 following adoption in 2004. Consistency between State and local plans is of primary importance in the identification of resources, the establishment of common goals and objectives, and identifying opportunities for interagency cooperation. LCOG staff reviewed these fundamental elements of the State Plan to ensure the local plan developed within this this established framework. One example of this consistency can be found in Hazard Identification where the State Plan established the need to consider Sea Level Rise in coastal areas. The techniques used to model, visualize, and forecast this threat are the same, and the conclusions drawn point toward Beaufort County as being particularly vulnerable to this hazard.

South Carolina Hurricane Plan

The South Carolina Emergency Management Division (SCEMD) publishes an annual *South Carolina Hurricane Plan* which includes a listing of hurricane shelters for various regions in the state including the Southern Coastal Conglomerate, of which Beaufort County is a part. While there are some shelters within Beaufort County, they do not open for storms that are greater than a Category 1 Hurricane. However, there are several shelters in adjacent counties within the conglomerate that are meant for use by Beaufort County residents. These include schools and community centers in the adjacent counties of Colleton, Hampton, and Jasper (as well as southern counties located further inland in Aiken, Allendale, Bamberg and Barnwell Counties). Some of these shelters are opened only for mandatory evacuations as ordered by the Governor, others are opened for both mandatory and voluntary evacuations, and a third group of reserve shelters are opened as determined necessary by local officials. A list of these shelters in adjacent counties is provided as Table 4-3.

Table 4-3. Regional Hurricane Shelters in Adjacent Counties

Colleton County Shelters		
Shelter	**Address**	**Capacity**
Colleton High School	1379 Mighty Cougar Drive Walterboro, SC 29488	853
Cottageville Elementary School	648 Peirce Road Cottageville, SC 29435	391
Contact: Suzanne Gant, Emergency Prep Director Phone: 843-549-5632		
Hampton County Shelters		
Shelter	**Address**	**Capacity**
Varnville Elementary	395 Pine Street, East Varnville, SC 29944	231
Wade Hampton High School	115 Airport Rd. Hampton, SC 29944	262
Hampton Elementary	705 South Hoover Street Hampton, SC 29924	228
Estill High School	1450 Columbia Hwy North Estill, SC 29918	382
North District Middle School	305 Hampton Road Varnville, SC 29944	624
Ben Hazel Primary School	628 West Railroad Ave. Hampton, SC 29924	184
Estill Middle School	555 West Third Street Estill, SC 29918	210
Estill Elementary	318 Fourth Street, East Estill, SC 29918	178
Contact: Suzanne Peeples, Disaster of Emergency Mgmt. Phone: 803-943-7522		
Jasper County Shelters		
Shelter	**Address**	**Capacity**
Coosawhatchie Community Center	SC Highway 462 West Coosawhatchie, SC 29940	135
Robertville Community Center	US Highway 321 Robertville, SC 29922	104
Ridgeland High/Junior/Elementary Complex	250 Jaguar trail Ridgeland SC 29936	2,256
Hardeeville South Campus	150 Hurricane Alley Hardeeville, SC 29927	1,000
Contact: Wilbur Daley, Director of Emergency Services Phone: 843-726-7798		

Source: SCEMD

Although these shelters are available for use by Beaufort County residents, many residents are not aware of their existence and their function during disaster situations. ***Beaufort County citizens should be better informed about the existence and locations of the shelters and the fact that they are available for their use.***

As described in the Beaufort County Disaster Response and Recovery Plan, there is an insufficient coverage of special needs shelters to serve County residents in the event of a hazard. Currently, there are only two recognized special needs shelters in the Lowcountry as identified by the State Hurricane Plan. Table 4-4 indicates the locations of these shelters.

Table 4-4: Lowcountry Special Needs Shelters

Colleton County	
Shelter	**Address**
Colleton Medical Center	501 Robertson Blvd. Walterboro, SC 29488
Hampton County	
Shelter	**Address**
B.T. Deloach Building	201 Jackson Ave. Hampton, SC 29924

According to the State plan, there is an agreement pending for special needs facilities in Jasper County, and future updates to this plan will provide this information as it becomes available. In general, the question of services for special needs populations in the event of a natural disaster deserve further examination, not only in terms of sheltering, but also in terms of emergency notification and transportation.

The South Carolina Local Government Comprehensive Planning Enabling Act of 1994 gave local governments (counties and incorporated towns/cities) five years to bring their planning programs and regulatory ordinances into compliance. The Act repealed existing planning legislation as of May 4, 1999, requiring that a Comprehensive Plan be used as a tool for guiding future development. The Act consolidates existing planning legislation for local governments into one law and defines a set of requirements that must be met for the planning activities of a local government to be legal. In particular, the Act describes required comprehensive plan elements; defines the roles of the town council, planning commission, and zoning board of adjustment; and outlines the public review process and procedures for adopting comprehensive plans and land use ordinances.

South Carolina Department of Health and Environmental Control (SC-DHEC)
Ocean and Coastal Resource Management (OCRM)

- ***The Coastal Tidelands and Wetlands Act*** (1977) was amended in 1993, creating the South Carolina Coastal Zone Management Act.

- ***The South Carolina Coastal Zone Management Act***, which merged the South Carolina Coastal Council with DHEC, creating OCRM whose general purpose is to:
    - Protect the coastal environment, and
    - Promote economic and social improvement of the Coastal Zone
    - It identifies "Critical Areas" as coastal waters, tidelands, dune systems, and the beach, and gives DHEC permitting authority in those areas.
    - Identifies salt/brackish marshes as protecting highlands from erosion and storm damage

- ***The Beachfront Management Act*** (BFMA, 1988) establishes authority to address erosion hazards due to persistent sea level rise, a lack of comprehensive beach management planning, and poorly planned coastal development. The BFMA establishes

"retreat" as the basic approach to beachfront management, rejecting "armoring" and including beach nourishment as a mechanism to assist in retreat.

The basic policy is one of a 40-year retreat, and establishes a Baseline and Setback on all oceanfront properties. The Baseline is the crest of the primary dune (or where it *would have been*). The Setback is 40 times the annual rate of erosion, but always at least 20 feet.

The BFMA also establishes rules for rebuilding structures, seawalls and bulkheads. Structures (including swimming pools) cannot be repaired or replaced if they are destroyed, or damaged greater than 66.67% of their replacement cost. Seawalls and bulkheads cannot be repaired or replaced if they are destroyed, or damaged greater than 66.67% of their (above grade) replacement cost between July 1, 1995 and June 30, 2005. Beginning July 1, 2005, seawalls and bulkheads cannot be repaired or replaced if they are destroyed, or damaged greater than 50%.

Federal Regulations

- ***The National Flood Insurance Program (NFIP)***: Established in 1968, the NFIP provides flood insurance in communities that agree to regulate new development in identified Special Flood Hazard Areas through the adoption and enforcement of a minimum Flood Damage Prevention Ordinance. It also requires, as a condition of every federally backed mortgage within an identified Special Flood Hazard Area, to require the purchase and maintenance of a flood insurance policy for the life of the loan.

- ***The Coastal Barrier Resources Act (CoBRA)***: Established in 1972, the CoBRA is environmental legislation administered by the Fish & Wildlife Service. It provides for the identification and protection of Coastal Barrier Resources. It prohibits the availability of federally backed assistance within identified areas, including grants, loans, mortgages and flood insurance.

- ***Coastal Zone Management Act (CZMA):*** Established in 1972, and amended by the Coastal Zone Protection Act of 1996, the CZMA defines a national interest in the effective management, beneficial use, protection and development of the Coastal Zone and identified the urgent need to protect this natural system from these competing interests. The Act encourages states to exercise their full authority over the lands and waters of the Coastal Zone. Annual cost-share grants to states creates an incentive to establish land-use and environmental protection standards that have served to reduce damage from coastal storms, as well as achieve its other multi-objective goals.

5. Mitigation Goals and Objectives

Introduction

This section of the Beaufort County Hazard Mitigation Plan describes the goals and objectives established by the Regional Hazard Mitigation Steering Committee, and the completed and anticipated actions for implementation and maintenance of this plan in an ongoing effort to achieve these goals.

Goals and Objectives for the Mitigation Plan

The Beaufort County Hazard Mitigation Planning Committee had established a number of goals and objectives for the original plan in 2004 to guide its work in the development of that plan. Those goals and objectives were modified for the first update in 2010.

This year, as part of the regional approach involving all four Lowcountry counties, the Hazard mitigation Steering Committee developed a new set of directing policies that incorporated both regional considerations and changes in technology. The overall principles, however, remained the same.

The updated goals are listed below. However, the action items that were recommended in the original goals are addressed in terms of their completeness and as to why any item may have not been completed in the following pages (Tables 6-2 to 6-6).

Overall Guiding Principles:

- Bridging the unique needs and common goals of the four counties and their communities.
- Saving lives and protecting property.
- Taking a regional approach.
- Complimenting the State Plan.
- Accessing funding to implement recommendations (projects and policies).

Goal #1 Ensure the Protection of All Critical Facilities.

Objectives

a. Protect facilities from natural hazard threats.

b. Identify and schedule repairs and other improvements needed in order to ensure buildings are in adequate conditions and with adequate equipment to function in the event of a disaster.

Goal #2 Evacuation is safe, efficient, and shelters have sufficient carrying capacity.

Objectives

a. Evacuation routes should be proven safe and efficient. Counties work with each other and SCDOT on highways connecting the counties.

b. The number of area shelters should be adequate and safe for the amount of people that may potentially use them. The shelters should be able to accommodate all members of the area's population, including those with special medical or other needs.

Goal #3 Increase Public Education and Awareness of Natural Hazards

Objective

a. Develop an ongoing public communications and education program including a web site, pamphlets, informational packets, and articles in the local media.
b. Incorporate the use of social media, including Facebook ™ and Twitter™ to ensure that as many segments of the population as possible are reached.

Goal #4 Enhancement and Adoption of New Policies and Projects to Mitigate Natural Hazards

Objective

a. Plans, codes, zoning, and other mechanisms should address natural hazard mitigation, and expand on present policies to further protect the counties and incorporated municipalities (floodplains, repetitive loss areas, etc). All jurisdictions should adopt the state building code.

Goal #5 Emergency Response: Preparedness EMS, police, fire, and other departments should have sufficient and up to date equipment and training in order to ensure the safety of residents.

Objectives

a. There should be funding to buy new equipment (e.g., communications and power) if necessary.
b. There should be funding to train employees if necessary.
c. Maintain and enhance working relationships among the departments among all four counties.
d. Coordinate with the county and regional offices of the various state human services departments.

Goal #6 Reduce the Impact of Wind on Homes and Buildings. Wind damage is a threat to homes and buildings in the region. Means should be taken to decrease the effects of wind on homes and buildings within the counties.

Objectives

a. Code revisions to reduce the impact of wind on homes and buildings.
b. Grants, including SC Safe Homes, for preventative measures (such as housing grants).

Goal #7 Reduce the Impact of Floods on Homes and Buildings. Projected sea-level rises in the Lowcountry will be included, utilizing such information and mapping as is currently available to help determine the areas and magnitude of impacts.

Objectives

a. Zoning enforcement, floodplains.

b. Grants for preventative measures, to include elevation and property acquisition.

c. Building code revisions

d. Stormwater management

e. Work toward the lowering of the CRS rating.

Goal #8 Maintain the IT capabilities of local governments to ensure continuity of operations in the event of disaster

Objective

a. Support the use of centralized technology, located as far inland as possible.
b. Develop a hosted (for instance, the "cloud") storage system.

Goal #9 Ensure the Protection and Continued and Uninterrupted Operation of Communications on a regional basis

Objective

a. Determine if the current regional communications infrastructure is adequate to meet the needs.
b. Identify what improvements are needed.

Goal #10 Ensure the Protection of Utilities

Objective

a. Utilities must be inspected and assessed for their vulnerability and their ability to handle natural disasters.

6. Mitigation Action Plan (and update of previous actions)

Based on the goals and objectives, the Hazard Mitigation Steering Committee conducted a review of the actions recommended in the 2009 plan, the status of their implementation, and developed new actions in response to the evolving needs of the region. Action items were carefully considered, particularly in regard to the protection of both new and existing buildings and all critical facilities. Throughout the process there was frequent consultation with the representatives of the jurisdictions to discuss and improve the specific recommendations. When the assessment was completed, the Committee reviewed the results and made further County-wide and individual municipality recommendations that were incorporated.

Explanation of Tables

For clarity's sake, a brief explanation of the mitigation action tables should be addressed. Table 6-1 was created for the 2004 plan, and used again in the 2009 update as a scoring table and cost benefit review tool to further prioritize the actions. Based on this table, each mitigation action was given a score and a priority designation of High (a score greater than 20), Medium (a score of 10-19) and Low (a score less than 10).

Tables 6-2 through 6-6 are status reports on all of the proposed mitigation actions from the 2009 plan. This prioritization is intended to comply with the intent of the NFIP and reflect a cost-benefit review of each action.

Table 6-7 through Table 6-11 are the most up-to-date list of the goals, actions, prioritization, approximate time of completion and approximate cost for **each** jurisdiction. It reflects the work of the HMSC throughout this process, and it gives an idea of where we would like to be in five years. Each action is given a designation of high, medium or low based on the score it received. This enables the Hazard Mitigation Steering Committee to identify which of the established goals and objectives are to be addressed by the proposed action item. By considering the goals when establishing new action items, the Hazard Mitigation Steering Committee focused its efforts on implementing mitigation actions based on the established goals and objectives.

Each of the four jurisdictions has its own table. While some of the actions are similar or the same, it is necessary for each jurisdiction to have its own list of actions to mitigate hazards.

National Floodplain Insurance Program—prioritization and participation

All of the actions that the Hazard Mitigation Planning Committee developed were **established and prioritized** using several criteria. Primarily, the Hazard Mitigation Planning Committee established the actions **based on the National Floodplain Insurance Program**; the actions are intended to fulfill the requirements of the NFIP, and the goals and mitigation actions reflect this. All participating jurisdictions are participants in the NFIP and not under any sanctions. Beaufort County and its municipalities participating in this plan have been mapped for flooding. All of the communities in Beaufort County are committed to NFIP's continued success. All of the identified hazards are addressed by an action item, and a significant number of the mitigation actions were formulated in order to reduce loss and damage from flood.

The Prioritization Scoring Table 6-1 was developed as a means of prioritization of the action items based on the NFIP. The scoring criteria represents a cost-benefit review and the **project's feasibility** is reflected from these scores. A score was figured for each mitigation action which was evaluated on the criteria from Table 6-1, with the highest score being 27 and the lowest being zero (0). The actions were then prioritized based on the scores.

Addressing Known Risks and Vulnerabilities

The process of selecting actions to mitigate known threats to hazards began with a review of the previous action items and goals, as is mentioned in the Planning Section of this plan. Committee members also consulted personnel from within their respective agency or organization. The resulting list is part wish-list and part a reflection of the threats to Beaufort County. This list is an indication of the problems that Beaufort County needs to address, based on complaints, cost of repairs, and perceived future needs.

As the Beaufort County Hazard Mitigation Plan is reviewed and updated, the goals / objective statements are also reviewed to ensure they are still applicable to meeting the unique needs, interests and wishes of the community.

Table 6-1: Prioritization Scoring Table

Priority Criterion	Numeric Score			
	0	**1**	**2**	**3**
Strategy effectiveness, in terms of affected structures.	No effect on risk or hazard	Affects several structures within the community	Affects many structures within the community	Affects most structures within the community
Percentage of population benefitted	Less than 10% benefitted	10% to 15% benefitted	50% to 75% benefitted	Greater than 75% benefitted
Time to implement	Cannot be implemented	Long term	Within one year	Immediate
Time to impact	Cannot be implemented	Long term	Within one year	Immediate
Cost to community	Completely unaffordable	Expensive	Inexpensive	Little to no Cost
Funding source	No known Funding source is available	Requires outside Funding	Requires budget consideration	Within existing county budget
Cost to others	Cost to others is unacceptable	Expensive, but manageable	Cost is easily managed by others	No cost to others
Community support	Opposed by the entire community	Some community opposition	Acceptable only to those affected by the project	Acceptable community wide
Project feasibility	Not possible	Accomplished with extensive design and planning	Accomplished with some design and planning	Easily accomplished

Benefit-to-Cost Review

A key analytical measure commonly used in vulnerability assessments is the benefit to cost ratio, which expresses the estimated benefits, in dollars, in comparison to the estimated costs to implement and maintain the proposed mitigation initiative. For an action to be considered cost effective, the dollar value of the benefits derived needs to exceed the costs to implement and maintain the initiative, or, in other words, the benefit to cost ratio should be greater than 1.0. The process for calculating a benefit to cost ratio begins with estimating the direct and indirect costs of the "worst case" disaster scenario that the mitigation initiative is intended to address. If the initiative were to be implemented, these are the future costs that would be avoided, or, in other words, the benefits derived from implementing the action.

Both direct costs of the disaster scenario are considered, such as structural damages, as well as indirect costs, such as lost wages. The total of the direct and indirect costs are then divided by the predicted life of the initiative, in years. This then gives the dollar benefits of the project on an annual basis. The cost side of the benefit to cost ratio is by determining the estimated cost to initially implement the proposal, such as initial construction cost for a "bricks and mortar" project, or the development costs for a training program. To this amount is then added any annual costs that implementation of the project would incur, such as annual operations and maintenance costs or annual implementation costs.

Next, the approach then considers any **cost impact** of the proposal, or the costs that would be incurred by others in the County due to implementation of the initiative, such as the economic effect on new construction of adopting a more stringent building code. The cost impact figure is also annualized by the life of the project, and then any annual cost impact values, such as an annual user fee or tax, is added to give a total annual cost impact. Finally, by dividing the annual costs of the benefits of the proposal by the annual cost and cost impact necessary to implement the proposal, a benefit to cost ratio is estimated. A more sophisticated methodology for calculating a benefit to cost ratio is likely to be necessary at the time of actual implementation, applying to state or federal agencies for funding, or for the design and construction stage of development.

Cost Benefit Review—Prioritization of Mitigation Actions

Currently, no benefit-cost analysis has been conducted for each of the mitigation actions in this plan. This is due to both the lack of information and this type of evaluation is beyond the scope of the plan. However, the Hazard Steering Committee considers the priority scoring table a valuable cost-benefit review tool, and thus has prioritized the actions based on those scores. The higher scored mitigation actions reflect actions that meet a higher standard on more criteria, and are thus considered much more cost efficient and beneficial to the community. Furthermore, when each mitigation action is considered for particular funding, the responsible agency will conduct an in depth cost-benefit analysis of the project.

It is possible to see from this table that the minimum priority rank for a proposed initiative would be zero, while the maximum would be twenty-seven. As noted above, this priority

ranking may differ from the true priority for implementation assigned to a specific mitigation initiative based on unanticipated conditions or situations occurring at a certain time, which could change with such conditions. The priority ranking given through application of the ten criteria in the above table will remain constant through time because of the inherent characteristics of the proposed initiative, unless those characteristics are also modified.

All of the actions are listed with their priority designation assigned to each as a result of the common process to characterize and prioritize mitigation initiatives that is used by all participants in the planning process. This priority ranking is a long-term characterization value directly associated with each specific initiative based on its own merits at the time it was first proposed by the individual participant. The priority ranking is intended to serve as a guideline for the Hazard Mitigation Planning Committee regarding the relative desirability of implementation of a specific mitigation initiative in relation to the other proposed initiatives incorporated into the plan.

2009 Actions Status Update

As reflected in tables 6-2 through 6-6, each mitigation action is assigned to a particular jurisdiction—and, when possible, a particular department within that jurisdiction. These tables show the action items that were taken from the previous plan. The status of these items was reported, and the update is given. Below, please find the original action items with their status. If the project is listed as “ongoing,” some form of that mitigation action still appears in the updated plan.

Beaufort County 2009 Actions and Status

Table 6-2: 2009 Actions and Status, Beaufort County

Beaufort County 2009 Mitigation Actions	Implementation Status
Storm shutters on should be placed on all administrative buildings to ensure administrative functions can continue.	Shutters are in place at the Library, Detention Center, and Public Works.
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	Bluffton Fire District renovated 80 % station 33 to new IBC standards. New construction such as station 30 has implemented storm resistant features such as hurricane windows and netting. Replacements to stations 36 and 37 are in negotiation and are expected 2017/2018. Lady's Island-St. Helena Fire District constructed a new headquarters which meets new codes for Storm resistance and features impact resistant windows. All district facilities were inspected by the insurance carrier in 2014.
Monitor all existing dams for structural integrity and work to replace any faulty structures	Inspections were not completed as they were not deemed necessary for hazard threat level.
Study of vulnerable bridges to determine which ones should be hardened	Bridges are subject to SCDOT inspection and replacement program. The McTeer Bridge parallel was completed in 2011. The Bluffton Parkway flyover bridge will be complete in 2016. The Harbor River Bridge is in permitting to begin construction in 2017.
Maintenance and replacement of critical bridges	Bridges are subject to SCDOT inspection and replacement program. The McTeer Bridge parallel widening was completed in 2011. The Bluffton Parkway flyover bridge will be complete in 2016. The Harbor River Bridge is in permitting for 2019.
Work toward the TsunamiReady community designation	Not complete. Evacuation procedures have been revised to incorporate Tsunami conditions.
Include fire sprinklers in buildings for when emergency personnel are unable to reach them during a hazard.	Sprinklers are installed in new construction according to building codes.

Beaufort County 2009 Mitigation Actions	Implementation Status
Make improvements to the St. Helena Wastewater Treatment Plant to protect it from flood damage	No structural improvements or retrofits were identified which could reduce flood hazard. Road improvements scheduled for 2016 will improve emergency access to plant.
Protect the Chelsea Water Treatment Plan from flood damage.	Application to SCEMD is in development for raising the wall on the sediment tank.
Protect the Duke and Lauren Streets wastewater collection system from inflow problems.	Completed in 2013.
Distribute "Citizen's Guide to Flood Awareness" brochure regularly	Revised 2015. The brochure is sent to everyone residing in a special flood hazard zone each year. The brochure is also available in the Yellow Pages, the library, and on the County website.
The county to work with Regional media to promote public awareness of disaster preparedness	Media messages are coordinated at quarterly regional meetings of emergency managers. Key media partners include WTOC, WSAV, The Island Packet, and the Beaufort Gazette. The County EMD participates in Chamber of Commerce hurricane preparedness events that coordinate with regional media.
Enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	The Beaufort Soil and Water Conservation District conducts educational programs at schools, including training for educators.
Ensure all fire marshal burn bans are strictly enforced, especially during drought conditions	Ongoing. Burn ban enforcement is coordinated between the fire districts and the Beaufort County PD.
Create a brochure and education program to inform the community about the danger of land fires and resources on how to prevent them	Ongoing. The NCRS is promoting prescribed burning and coordinates workshops where landowners/managers may obtain certification as a burn manager.
Work to enhance public education program for historic property, including a pamphlet for distribution to the public	Ongoing. The Beaufort County Historical Preservationist developed a post-disaster recovery pamphlet.

Beaufort County 2009 Mitigation Actions	Implementation Status
Beaufort to create a centralized information technology system to access pertinent information during a disaster.	As of 2014/2015, Beaufort County will use the GovDelivery digital communications platform to disseminate pertinent information in the event of a disaster. Citizens can sign up to receive disaster recovery information from Beaufort County via email or text message.
Append this to all comprehensive plans as they are updated, or at earliest date available	The 2015 comprehensive plan will reference HMP.
Make hazard mitigation a stand-alone element of comprehensive plans as updated	The 2015 comprehensive plan will reference HMP.
Create tree survey for vulnerable trees to re-enforce them against hazards (wind, flood)	Not complete. Scope of project is an impediment to study and implementation.
County will consider the use of priority development zones in non-hazard prone areas	Not Complete. Future development is guided by the future land use map which includes provisions for identifying lands for preservation, or limitations on development.
Create survey to ID most vulnerable structures in County and create a CIP list of these structures	Not Complete.
Harden historic structures at USCB	Currently no structures are scheduled for improvements at USCB. Improvements to the warning and alert system are scheduled and improvements to the drainage system have been made.
County to work to expedite re-build of historic structures post disaster	Ongoing. Rebuild will be expedited by permitting one stop.
Continue enforcing seismic program & regulations in building codes	Ongoing. Seismic standards for all construction are required by IBC, IRC, ASCE-7
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Pending increased rates for public utilities, level of service will expand to more proactively maintain stormwater infrastructure, and fund capital programs for regional retrofits.
The County will undertake a program to study poorly drained areas and remedy them through best practices.	The stormwater management plan will be updated in 2015/2016 to develop capital projects based on water quantity and quality.

Beaufort County 2009 Mitigation Actions	Implementation Status
Create an education program for the agricultural sector that promotes sustainable practices during drought conditions	Ongoing. The Soil and Water Conservation District coordinates with the NCRS to distribute BMP funding to agricultural sector.
Incentivize sharing of docks in zoning ordinances	Complete. Adjoining properties may qualify for a dock length bonus if shared facilities are constructed.
Updated GPS systems available for emergency personnel	Ongoing. GPS tracking for EM personnel and vehicles was instituted in 2011.
County will conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	Ongoing. Equipment checks are performed on a weekly basis.
Enhance radio technology for all building officials for hazard preparation	Ongoing. The County radio system was converted to digital in 2009/2010. The system was fully encrypted as of 2014/2015.
County will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Ongoing. The County obtained new LIDAR data in 2013, and is expecting new flood maps in 2015.
Digitize elevation certificates for convenience and ease of access (although all written documents will be maintained)	Complete. Elevation certificates are digitized and available to the public.
Update all flood maps with new municipal and county boundaries	Ongoing. County is working to facilitate area studies and is expecting new flood maps in 2015.
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Ongoing. Flood elevations are required for the special hazard zones as well as signed flood zone verifications from the engineer/architect for new construction.
Train Building Officials on most up to date code requirements for hazard resistant construction	Ongoing. The Building Official represents the County at the regional home builders association which meets every 2 months to discuss changes in codes.

Beaufort County 2009 Mitigation Actions	Implementation Status
Building Codes Department will conduct SCDNR approved classes for floodplain management	Ongoing. Classes are conducted 1-2 times per year.
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	Ongoing. The Floodplain Manager represents the County at the local structural engineers association and presents on code updates.
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	Ongoing.
Create a joint permitting center for post-hazard recovery.	Complete. These efforts were coordinated between Building Codes and Emergency Management in 2012.

City of Beaufort 2009 Actions and Status

Table 6-3: 2009 Actions and Status, City of Beaufort

City of Beaufort 2009 Mitigation Actions	Implementation Status
Storm shutters on should be placed on all administrative buildings to ensure administrative functions can continue.	New administrative building is protected by storm resistant features such as impact resistant glass.
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	New fire headquarters - is under construction on Ribaut Road and expected to be operational as of early 2016. New construction conforms to strengthened building codes for storm and seismic events.
Study of vulnerable bridges to determine which ones should be hardened	Bridges are subject to SCDOT inspection and replacement program.
Maintenance and replacement of critical bridges	Bridges are subject to SCDOT inspection and replacement program.
Harden New City of Beaufort Building	New administrative building is protected by storm resistant feature such as impact resistant glass.
Include fire sprinklers in buildings for when emergency personnel are unable to reach them during a hazard.	Fire sprinklers are installed in new construction according to building codes.
Make improvements to the St. Helena Wastewater Treatment Plant to protect it from flood damage	No structural improvements or retrofits were identified which could reduce flood hazard. Road improvements scheduled for 2016 will improve emergency access to plant.
Protect the Chelsea Water Treatment Plan from flood damage.	Ongoing. Application to SCEMD is in development for raising the wall on the sediment tank.
Protect the Bay/Lauren Streets stormwater collection system from inflow problems.	Completed in 2013.
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Ongoing. Brochure is revised and distributed regularly
The City to work with Regional media to promote public awareness of disaster preparedness	Media messages are coordinated with the County to ensure consistent information is broadcast to citizens. Depending on the scale and location of an incident, messages to media may be made by the media spokesperson of individual departments.

City of Beaufort 2009 Mitigation Actions	Implementation Status
Enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	Ongoing. The Beaufort Soil and Water Conservation District conducts educational programs at schools, including training for educators.
Create a brochure and education program to inform the community about the danger of land fires and resources on how to prevent them	Ongoing. The NCRS coordinates burn manager certification courses to increase the practice of prescribed burning.
Work to enhance public education program for historic property, including a pamphlet for distribution to the public	Ongoing. The pamphlet has been reissued.
City of Beaufort to create a centralized information technology system to access pertinent information during a disaster.	The City of Beaufort contracts with a third party IT service which manages servers and cloud storage which can be accessed remotely in the event of an emergency.
Append this to all comprehensive plans as they are updated, or at earliest date available	Chapter 7 of the Comprehensive Plan titled Climate Change and Energy refers to the HMP and sets implementation as a goal.
Make hazard mitigation a stand-alone element of comprehensive plans as updated	Chapter 7 of the Comprehensive Plan titled Climate Change and Energy refers to the HMP and sets implementation as a goal.
Create tree survey for vulnerable /historic trees to re-enforce them against hazards (wind, flood)	Inventory of hazard trees is ongoing.
City will consider the use of priority development zones in non-hazard prone areas	Not complete.
Create survey to ID most vulnerable structures in County and create a CIP list of these structures	Not complete.
Harden historic structures at USCB	Currently no structures are scheduled for improvements at USCB. Improvements to the warning and alert system are scheduled and improvements to the drainage system have been made.

City of Beaufort 2009 Mitigation Actions	Implementation Status
Continue enforcing seismic program &regulations in building codes	Ongoing.
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Ongoing. The City and the County have recently coordinated efforts on an EPA 310 grant.
The City and municipalities will undertake a program to study poorly drained areas and remedy them through best practices.	Ongoing. Two new drainage projects in the historic district are ready for bidding.
Incentivize sharing of docks in zoning ordinances	Not complete.
Updated GPS systems available for emergency personnel	Ongoing. Beaufort City Police Department vehicles have been outfitted with GPS tracking capabilities, as well as the lapel microphones worn by officers.
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget.	Ongoing. Equipment checks are performed on a weekly basis.
Enhance radio technology for all building officials for hazard preparation.	Ongoing. Portable radio systems have been brought in by some departments to increase bandwidth.
City will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Ongoing. New floodplain maps are expected in 2015.
Work with the USACE and FEMA to develop new maps	Ongoing. New floodplain maps are expected in 2015.
Digitize elevation certificates for convenience and ease of access (although all written documents will be maintained)	Complete as of 2015. Archive is publicly available and searchable.
Update all flood maps with new municipal and county boundaries	Ongoing. New floodplain maps are expected in 2015.

City of Beaufort 2009 Mitigation Actions	Implementation Status
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Ongoing. Building official is a certified floodplain manager. Attends yearly conferences and trainings.
Train Building Officials on most up to date code requirements for hazard resistant construction	Ongoing.
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	Ongoing. The Building Codes office sponsors quarterly workshops with local contractors.
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	Ongoing.
Enforce property maintenance code to correct deteriorating conditions	Ongoing. Staffing has been increased for enhanced enforcement of property maintenance codes.
Create a joint permitting center for post-hazard recovery.	Not complete.

Town of Bluffton 2009 Actions and Status

Table 6-4: 2009 Actions and Status, Town of Bluffton

Town of Bluffton 2009 Mitigation Actions	Implementation Status
Storm shutters on should be placed on all administrative buildings to ensure administrative functions can continue.	Complete. The Bluffton Public Works Department places temporary storm protection measures on administrative buildings.
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	Ongoing. Bluffton fire district renovated 80 % of station 33 to new IBC standards. New construction such as station 30 has implemented storm resistant features such as hurricane windows and netting. . Replacements to stations 36 and 37 are in negotiation and are expected 2017/2018.
Study of vulnerable bridges to determine which ones should be hardened	Assessments of bridges in Beaufort County are routinely conducted by SCDOT which guides scheduled repairs and replacements.
Maintenance and replacement of critical bridges	Assessments of bridges in Beaufort County are routinely conducted by SCDOT which guides scheduled repairs and replacements.
Include fire sprinklers in buildings for when emergency personnel are unable to reach them during a hazard.	Sprinklers are installed in new buildings according to building codes.
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Ongoing. Bluffton has a wide range of emergency preparedness materials available to the public at administrative buildings. Presentations are given to the public by Emergency Management on a regular basis which address flood hazards among others.
The town to work with Regional media to promote public awareness of disaster preparedness	Ongoing. The Town of Bluffton coordinates press releases with a variety of local media to keep citizens updated with emerging information on hazards and hazard preparedness. The Town also utilizes social media such as Twitter and Facebook to convey important messages.
Create a brochure and education program to inform the community about the danger of land fires and resources on how to prevent them	Ongoing. The NRCS of Beaufort County promotes best management practices to landowners and conducts workshops which allow landowners and managers to become certified burn managers, increasing the practice of prescribed burning.

Town of Bluffton 2009 Mitigation Actions	Implementation Status
Work to enhance public education program for historic property, including a pamphlet for distribution to the public	Ongoing. A pamphlet on historic properties is available at the Town Hall.
Create a centralized information technology system to access pertinent information during a disaster.	Complete. Servers were relocated to the Emergency Operations Center in 2008.
Append this to all comprehensive plans as they are updated, or at earliest date available	Complete. 2014.
Make hazard mitigation a stand-alone element of comprehensive plans as updated	Complete. 2014.
Create tree survey for vulnerable trees to re-enforce them against hazards (wind, flood)	Ongoing. Public Works conducts yearly surveys and reinforcement.
Consider the use of priority development zones in non-hazard prone areas	Ongoing. The TDR program establishes receiving areas for development.
Create survey to ID most vulnerable structures in Town and create a CIP list of these structures	Completed by Building Department.
Work to expedite re-build of historic structures post disaster	Ongoing. New disaster response and recovery plans have been developed by the EMD as of 2014/2015.
Continue enforcing seismic program &regulations in building codes	Ongoing
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Ongoing
The town will undertake a program to study poorly drained areas and remedy them through best practices.	Ongoing. The Stormwater Department continues to follow the recommendations of the May River Watershed Action Plan completed in 2011 as well as the requirements of MS4 regulations.

Town of Bluffton 2009 Mitigation Actions	Implementation Status
Incentivize sharing of docks in zoning ordinances	The Bluffton UDO adopted in 2011 encourages the sharing of docks and restricts the placement of docks to properties with at least 75 ft. of water frontage.
Updated GPS systems available for emergency personnel	Beaufort County implemented GPS tracking for emergency vehicles and personnel in 2011.
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	Ongoing. Emergency equipment is inspected on a monthly basis. Emergency Management was taken over by the Police Department as of 2015. The Emergency Operations Center established by the PD has been outfitted with new computers, monitors, and satellite phones.
Enhance radio technology for all building officials for hazard preparation	Ongoing. System enhancements have been conducted by Beaufort County from 2009-to 2015. Radio systems were converted to a digital format in 2009. Encryption of radio communication was completed in 2014/2015.
Town will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Ongoing. The GIS Department is working to update IMP service and has provided new aerial photo images as of 2015.
Digitize elevation certificates for convenience and ease of access (although all written documents will be maintained	Complete. The Town adopted the FEMA filing model and the filing system matches that system. The Town also keeps copies digitally as part of the permanent record and can be accessed digitally by address.
Update all flood maps with new municipal and county boundaries	Ongoing. New FEMA flood maps are expected from the State in 2015.
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Ongoing.
Train Building Officials on most up to date code requirements for hazard resistant construction	Ongoing. The Chief Building Official attends the hazard mitigation conference annually, along with any flood workshops that occur (usually 2 per year). The own will have another staff person beginning training on the same schedule this year with the intent of taking the FPM test after the first of the year.
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	Not Complete. Staff are available each working day to answer questions and provide advice during the planning phase of projects.

Mitigation Action	Implementation Status
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	Ongoing.
Enforce property maintenance code to correct deteriorating conditions	Not Complete.
Create a joint permitting center for post-hazard recovery.	Complete. The Bluffton Law Enforcement Center has been designated to fulfill this function in the event of a major hazard.

Town of Hilton Head Island 2009 Actions and Status

Table 6-5: 2009 Actions and Status, Town of Hilton Head Island

Town of Hilton Head Island 2009 Mitigation Actions	Implementation Status
Continue to Conduct engineering inspections of fire stations as necessary to determine mitigation retrofitting measures necessary	Ongoing. Inspections have been completed and one new facility has been built. Shutters able to withstand a Category Five hurricane and fire sprinklers have been installed at six of the seven fire station facilities, Fire & Rescue Headquarters and Facilities Management buildings. Fire Station Two is slated for reconstruction in 2017.
Study of vulnerable bridges to determine which ones should be hardened and conduct maintenance of these bridges and HHI Causeways	Ongoing. Study conducted as a partnership with Beaufort County in 2012.
HHI will work with regional media to promote public awareness of disaster preparedness	Ongoing. HHI coordinates with local television stations, particularly WTOC and WHHI, to broadcast disaster awareness messages as an ongoing effort.
Distribute "Citizen's Guide to Flood Awareness" brochure regularly	On-going. In addition to several hurricane preparedness summits organized with the Chamber of Commerce, the Town participated in media interviews and spoke to citizen groups on disaster preparedness and participated in a one hour television special on hurricanes. The Town *Citizens Preparedness Guide*, which includes information on general preparedness, flooding, earthquakes, and hurricanes, is available to the public at all Town facilities, the Town's website, preparedness presentations and is distributed by mail and email to each resident. The Town's Emergency Manager also provides preparedness presentation to community groups, PUDs and informational tables at special events.
Use EMD's centralized information technology system to access pertinent information during a disaster.	Ongoing. Town has computerized FEMA damage assessment forms and developed a spreadsheet linked to Beaufort County Assessors data to expedite damage assessment reporting process. Information will be available to Town's emergency permitting center to expedite permitting process. Information is shared with all municipalities with MOU.

Town of Hilton Head Island 2009 Mitigation Actions	Implementation Status
Hilton Head will continue to implement structural drainage projects	Ongoing. In 2012 the Town of Hilton Head Island completed a new inventory and modeling contract, which will provide watershed/neighborhood models for analysis of secondary stormwater systems, as identified in the 2006 County SWMP. In 2013, a maintenance database was created to track complaints and deficiencies in the drainage system. The Town budgets annual funds for maintenance and capital improvements necessary to mitigate structural drainage problems and has three on-call, competitively bid contracts in place for infrastructure maintenance and construction. The Town has acquired drainage maintenance and access rights over systems in planned developments comprising 70% of the area on island.
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Ongoing. The Town executed a new updated stormwater management agreement with the County in 2011 and continues to coordinate budget and construction issues with Beaufort County.
The County and municipalities will undertake a program to study poorly drained areas and remedy them through best practices.	Ongoing. The Town has concluded watershed reports for the three watersheds initiated in 2012 and is concluding work to develop a watershed plan for the headwaters of Broad Creek for 2014/2015. This area is comprised of two distinct (sub) watersheds.
Hilton Head will continue to use their land purchasing plan to obtain flood prone properties and designate them as open space.	Complete. Hilton Head has dedicated significant tracts for the dual purpose of public amenity and the protection of hydrological systems.
Hilton Head will continue to perform periodic nourishment of its beaches	Ongoing. Hilton Head has locally dedicated funding sources for beach nourishment on an ongoing basis. Two such projects were completed at Port Royal Plantation from 2011-2014. New beach nourishment projects are scheduled for 2016.

Town of Hilton Head Island 2009 Mitigation Actions	Implementation Status
Updated GPS systems available for emergency personnel	Ongoing. Hand held GPS units remain available to ensure personnel are able to determine their location and assist them in accomplishing critical tasks. The Town has satellite phones for response units and critical staff to ensure they have available communication if other options are not available. Emergency Management Guides and Plans have been developed to ensure personnel have access to the information they need and have direction on critical tasks when communications is limited. The Town continues to expand and update Emergency Operations Plans for pre-disaster and post-disaster response. Emergency response crews will have continuous access to information through multiple sources including Computer Aided Dispatch (CAD), Fire Rescue radios, cell phones, and satellite phones.
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	Ongoing. Equipment used by emergency personnel for pre-disaster and post-disaster operations are surveyed as needed and on an annual basis. This survey is conducted by emergency management staff and other Fire Rescue personnel. Emergency personnel survey equipment based on SOGs that include daily and weekly checks. A replacement plan is in place for all Fire Rescue apparatus, vehicles, and equipment. Fire Rescue had replaced 6 of the 7 fire stations with the final station in the design phase. This will ensure all fire stations are elevated and can withstand a Category 3 hurricane.

Town of Hilton Head Island 2009 Mitigation Actions	Implementation Status
Enhance radio technology for all building officials for hazard preparation	Not Complete.
Continue to work with SCDNR to update maps based on newer/more accurate topography data.	Ongoing. According to the State Floodplain Manager, new maps are expected in 2015.
Hilton Head will continue to work with the USACE and FEMA to develop new maps	Ongoing
Scan and store elevation certificates for convenience and ease of access (although all written documents will be maintained)	On-going. As of 2015, Hilton Head offers digital elevation certificates through the Town's Website. Staff are currently in the process of converting archived certificates to a digital format.
Update all flood maps with new municipal and county boundaries	Ongoing
HHI will continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances	Ongoing
Continue to Train Building Officials on most up to date code requirements for hazard resistant construction	On-going. Building officials as well as other Hilton Head staff attend yearly state and national conferences.
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	Ongoing. Building officials conduct workshops 1-2 times yearly.
Continue to educate public officials on the adoption of the latest versions of building codes and floodplain regulations	Ongoing

Town of Port Royal 2009 Actions and Status

Table 6-6: 2009 Actions and Status, Town of Port Royal

Town of Port Royal 2009 Mitigation Actions	Implementation Status
Storm shutters on should be placed on all administrative buildings to ensure administrative functions can continue.	Ongoing. The Port Royal police station was fitted storm shutters in 2014, improvements remain needed at the town hall and fire station.
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	New fire headquarters is in construction on Ribaut Road and expected to be operational as of 2016. New construction conforms to strengthened building codes for storm and seismic events.
Study of vulnerable bridges to determine which ones should be hardened	Ongoing. Bridges are subject to SCDOT inspection and replacement program.
Maintenance and replacement of critical bridges	Ongoing. Bridges are subject to SCDOT inspection and replacement program.
Include fire sprinklers in buildings for when emergency personnel are unable to reach them during a hazard.	Ongoing. Sprinklers are required in new construction per building code requirements.
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Ongoing. This information is provided to the public via the town website, a paper document has not been developed.
The town to work with Regional media to promote public awareness of disaster preparedness	Ongoing. Media messages are coordinated on a County-wide basis.
Enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	Ongoing. The Beaufort Soil and Water Conservation District conducts educational programs at schools, including training for educators.
Create a brochure and education program to inform the community about the danger of land fires and resources on how to prevent them	Ongoing. The NRCS of Beaufort County promotes best management practices to landowners and conducts workshops which allow landowners and managers to become certified burn managers, increasing the practice of prescribed burning.
Work to enhance public education program for historic property, including a pamphlet for distribution to the public	Ongoing. PR created a pamphlet in 2013 which includes an inventory of historic properties.

Town of Port Royal 2009 Mitigation Actions	Implementation Status
Append this to all comprehensive plans as they are updated, or at earliest date available	Completed in the 2014 update.
Make hazard mitigation a stand-alone element of comprehensive plans as updated	Not complete. This action will be incorporated into the 2019 rewrite.
Create tree survey for vulnerable trees to re-enforce them against hazards (wind, flood)	Ongoing. The Town has a tree ordinance and has created a special funding source for tree projects. A full inventory has not been completed.
Town will consider the use of priority development zones in non-hazard prone areas	Ongoing. In 2014 Port Royal adopted a new zoning code with districts that limit development in environmentally sensitive areas.
Create survey to ID most vulnerable structures in Town and create a CIP list of these structures	Not Complete.
Harden historic structures in downtown	Ongoing. The majority of the structures in the downtown are privately owned. Strategies to assist private property owners in seeking funding for retrofits should be investigated.
Work to expedite re-build of historic structures post disaster within historic building/remodeling guidelines.	Ongoing. Existing code regulates the alteration or remodeling of 36 recognized historic structures in the downtown.
Continue enforcing seismic program &regulations in building codes	Ongoing.
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Ongoing. BMP's are applied to all new projects.
The town will undertake a program to study poorly drained areas and remedy them through best practices.	Ongoing. Recent enhancements have been made to the cypress wetland system, connecting more drainage areas and improving outfalls. Significant repair and maintenance has been conducted system-wide in coordination with the County.
Incentivize sharing of docks in zoning ordinances	Not complete.
Updated GPS systems available for emergency personnel	Ongoing. GPS tracking for EM personnel and vehicles was instituted in 2011.
Town will conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	Ongoing. Equipment checks are performed on a weekly basis.

Town of Port Royal 2009 Mitigation Actions	Implementation Status
Enhance radio technology for all building officials for hazard preparation	Ongoing. Upgrades to communication systems have been made utilizing smartphones as opposed to radio.
Town will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Ongoing. The County obtained new LIDAR data in 2013, and is expecting new flood maps in 2015.
Digitize elevation certificates for convenience and ease of access (although all written documents will be maintained)	Complete. Starting in 2009, all elevation certificates have been digitized.
Update all flood maps with new municipal and county boundaries	Ongoing. County is working to facilitate area studies and is expecting new flood maps in 2015.
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Ongoing.
Train Building Officials on most up to date code requirements for hazard resistant construction	Ongoing. The Town hired a consulting firm who is fully certified for all commercial, building code on staff that is up to date certified on residential code Statewide certification (2015). Safebuild (2013)
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	Ongoing. Services have been contracted with a consulting firm that provides 3 workshops per year.
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	Ongoing.
Enforce property maintenance code to correct deteriorating conditions	Ongoing. A new property maintenance code was adopted in 2013.
Create a joint permitting center for post-hazard recovery.	Not complete.
Town to create a centralized information technology system to access pertinent information during a disaster.	Ongoing. In 2011 the Town of PR reached an agreement with a 3rd party to maintain servers in a remote location.

New and Ongoing Actions 2015

The Beaufort County Hazard Mitigation Plan contains the compilation of the proposed mitigation actions that have been formulated as the result of the planning efforts by the Hazard Mitigation Steering Committee and significant involvement of variety of regional stakeholders. The matrix below demonstrates how the plan will be administered and implemented based on jurisdiction, department responsible, potential funding sources, implementation timeline and a cost estimate (where available), based on the Hazard Planning Committee's evaluation. These mitigation actions form the fundamental mechanism for the implementation of the local mitigation plan. When the resources and opportunity to do so become available, the responsible organization implements an action to address the vulnerabilities of the facilities, systems and planning areas that have been identified through the mitigation planning process. After each successful implementation of an initiative, the benefited community will become that much more resistant to the impacts of future disasters.

Following is the Hazard Mitigation Action Item Matrix (Table 6.7-6.11), which describes all of the newly formulated and ongoing actions, their related goal, their priority based on the prioritization score, funding sources, estimated cost and approximate implementation date:

New and Ongoing Actions 2015 Beaufort County

Table 6-7: 2015 Actions Beaufort County

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Protective measures should be placed on all administrative buildings to ensure administrative functions can continue.	Thunderstorms, Hurricanes, Tornadoes	High/20	1	$50,000	Public Works, Engineering	PDM, HMGP, County and all municipalities	2016 Ongoing
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	All Hazards	Medium/17	1	$20,000	Engineering	County, PDM, HMGP	2015 Ongoing
Study of vulnerable bridges to determine which ones should be hardened	Hurricane, wind	Medium/15	1	$50,000	SCDOT, Public Works	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 Ongoing
Maintenance and replacement of critical bridges	Hurricanes, Wind, Earthquakes	Medium/15	1	$5,000,000	SCDOT	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 Ongoing
Work toward the TsunamiReady community designation	Tsunami, Flood	Medium/15	1	$10,000	Emergency Preparedness	PDM, HMGP, County,	2015 Ongoing
Continue replacement of lift station control panels with waterproof NEMA devices.	Flood	High/24	1	$5,000	BJWSA	PDM,HMGP	2015 Ongoing
Protect the Chelsea Water Treatment Plant from flood damage.	Thunderstorms, Hurricanes	Low/9	1	$30,000	BJWSA	BJWSA, PDM, HMGP	2017

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Distribute "Citizen's Guide to Flood Awareness" brochure regularly	Hurricanes	High/25	3	$5,000	Building Codes	All Jurisdiction, PDM, HMGP	2015 Ongoing
The county to work with Regional media to promote public awareness of disaster preparedness	All Hazards	High/24	3	$2,000	Building Codes/Emergency Preparedness	County, all municipalities	2015 Ongoing
Enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	Drought	Medium/17	3	$3,000	Planning, BJWSA, Soil and Water District	All Jurisdiction, PDM, HMGP	2015 Ongoing
Ensure all fire marshal burn bans are strictly enforced, especially during drought conditions	Drought	High/25	4	$10,000	Fire	Beaufort County	2015 Ongoing
Continue to support education programs to inform the community about the danger of land fires and resources on how to prevent them	Fire (Wildfire/Landfire)	Medium/17	3	$5,000	Planning/Fire, Soil and Water District	All jurisdictions, PDM, HMGP, SCDNR	2015 Ongoing
Work to enhance education programs for historic properties.	flood, seismic	Medium/14	3,6,7	$2,000	Planning	SHPO, all jurisdictions	2015 Ongoing
Formalize mutual aid agreements with Counties, DOT, SCEMD for debris removal	All Hazards		4	NA	Counties, Public Works, DOT, SCEMD, LCOG	Counties	2016

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Beaufort to create a centralized information technology system to access pertinent information during a disaster.	All Hazards	Medium/11	8	$10,000	Emergency Preparedness, Building	City of Beaufort, PDM, HMGP	2015 Ongoing
Append this to all comprehensive plans as they are updated, or at earliest date available	All Hazards	High/27	3,4	n/a	Planning	All jurisdictions	2015 Ongoing
Create survey to ID most vulnerable County facilities, particularly in terms of wind ratings for roofs, and create a CIP list of these structures.	Wind, Flood,	Medium/17	6,7	$6,000	Planning, Administration	County	2016
County to work to expedite re-build of historic structures post disaster	All Hazards	Low/8	4	$5,000	Building Codes	All jurisdictions, HMGP	2015 Ongoing
Continue enforcing seismic program & regulations in building codes	Earthquakes	High/26	4	n/a	Building Codes	All jurisdictions	2015 Ongoing
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM projects	Flood	High/21	4,7	n/a	Public Works, Planning, Building	BJWSA, all jurisdictions	2015 Ongoing
The County will undertake a program to study poorly drained areas and remedy them through best practices.	Flood	Medium/17	4,7	$20,000	Public Works, Engineering	All jurisdictions (except HHI), HGMP, PDM, CDBG	2015 Ongoing
Continue education program for the agricultural sector that promote sustainable practices (BMPS) and hazard resilience (particularly during drought).	Drought	Medium/14	3,4	$3,000	Planning, Soil and Water District	all jurisdictions	2015 Ongoing

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Updated GPS systems available for emergency personnel	All Hazards	Medium/19	5	$50,000	Emergency Preparedness, Building	PDM, HGMP, All jurisdictions	2015 Ongoing
County will conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	All Hazards	Medium/18	5	n/a	Building, Engineering	all jurisdictions	2015 Ongoing
Enhance radio technology for all building officials for hazard preparation	All Hazards	Medium/17	5	$10,000	Emergency Preparedness, Police, Fire	all jurisdictions, PDM, HGMP	2015 Ongoing
County will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Flood	High/20	5	unknown	SCDNR, Planning, Building	County, SCDNR, PDM, HGMP	2015 Ongoing
Update all flood maps with new municipal and county boundaries	Flood	Medium/12	5	n/a	SCDNR/FEMA, Building	all jurisdictions	2015
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Flood	High/25	4	n/a	Building	all jurisdictions	2015 Ongoing
Train Building Officials on most up to date code requirements for hazard resistant construction	All Hazards	High/22	4,5	$5,000	Building	all jurisdictions, PDM, HGMP	2015 Ongoing

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Building Codes Department will conduct SCDNR approved classes for floodplain management	Flood	Medium/15	3,4,5	No Cost	Building	Beaufort County with all jurisdictions participating	2015 Ongoing
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	All Hazards	High/21	3	$10,000	Building	all jurisdictions, PDM, HGMP	2015 Ongoing
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	All Hazards	High/20	4	$20,000	Planning, Building	All jurisdictions	2015 Ongoing
Explore and implement protective measures for the Beaufort County Library and the District Special Collection.	All Hazards	Medium/16	1,6,7	$10,000	Public Works, Community Services	Beaufort County	2017
Determine the vulnerability of backup power for critical facilities. Create a strategy for additional investment in generators and electrical upfits.	All Hazards	Medium/15	1	$50,000	Public Works, EMD	Counties, PDM, HMPG	2016
Support ongoing efforts for a regional warehouse for emergency supply storage.	All Hazards	Medium/15	1	$20,000	Public Works, EMD	Counties, PDM	2015 Ongoing
Staff dedicated to seek funding for Haz Mit projects, provide routine update of hazard plans, exercise other staff on plans, provide training to staff on disaster response and recovery.	All Hazards	High/23	4,5	$50,000	Engineering and Infrastructure	County	2016

Beaufort County 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Work to enhance County GIS data with more detailed information on individual structures	All Hazards	High/22	5	$5,000	GIS Department	GIS Department	2017
Explore the service of special needs and other vulnerable populations for evacuation and sheltering.	All Hazards	Medium/17	2	$5,000	EMD,EMS, Community Services	County, PDM, HMGP	2015 Ongoing
The County will support ongoing efforts educate the public on the threat of Sea Level Rise and associated hazards, exploring best practices for adaptation.	Flood	High/22	3,4	N/A	Planning, Engineering, SC Sea Grant, LCOG	County	2015 Ongoing
Continue to develop the use of social media/smart phone technology to inform citizens of hazard threats.	All Hazards	High 22	3,4	$5,000	EMD, IT, EMS	County	2015 Ongoing
Maintain or improve the County's CRS rating	Flood	Medium/16	4,7	n/a	Planning, Building	All jurisdictions	2015 (ongoing)
Explore the creation of Recovery Operations Center addition to Public Works Building with expanded facilities for key recovery personnel (kitchen, bunks, showers).	All Hazards	Medium/18	4	$50,000	Public Works, Engineering	County, PDM, HMGP	2017

New and Ongoing Actions 2015, City of Beaufort

Table 6-8: 2015 Actions City of Beaufort

City of Beaufort 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	All Hazards	Medium/17	1	$20,000	Engineering	City, Fire District, PDM, HMGP	2015 (ongoing)
Study of vulnerable bridges to determine which ones should be hardened	Hurricane, Wind, Earthquakes	Medium/15	1	unknown	SCDOT, Engineering	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing as funds are available)
Maintenance and replacement of critical bridges	Hurricane, wind, earthquakes	Medium/16	1	unknown	SCDOT, Engineering	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2016 (ongoing as funds are available)
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Hurricane, Flood	High/25	2,3	$10,000	Planning	City	2015 (ongoing)
The City to work with Regional media to promote public awareness of disaster preparedness	All Hazards	High/24	2	$2,000	Planning, EMD	County, All municipalities	2015 (ongoing)
Support and enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	Drought	Medium/17	3	$3,000	Planning, Soil and Water District	All Jurisdiction, PDM, HMGP	2015 Ongoing

City of Beaufort 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Work to enhance public education programs for historic property, including a pamphlet for distribution to the public	Flood, Seismic	Medium/14	3,6,7	$2,000	Planning	SHPO, City	2015 Ongoing
Ensure all fire marshal burn bans are strictly enforced, especially during drought conditions	Drought, Wildfire	High/25	4	$10,000	Fire, PD	All jurisdictions	2015 Ongoing
Continue to support education programs to inform the community about the danger of land fires and resources on how to prevent them	Fire (Wildfire/Landfire)	Medium/17	3	$5,000	Soil and Water District, Planning	All Jurisdiction, PDM, HMGP, SCDNR	2015 (ongoing)
Append this to all comprehensive plans as they are updated, or at earliest date available	All Hazards	High/27	3,4	n/a	Planning	All jurisdictions	2015 Ongoing
Continue tree surveys and enhance efforts to ensure the health of Beaufort's urban forest.	Flood, Wind	Medium/17	6,7,4	$20,000	Planning	City, PDM, HMGP, SC Forestry Commission	2015 (ongoing)
Create survey to ID most vulnerable structures in City and create a CIP list of these structures	Wind, Flood,	Medium/17	6,7	$6,000	Planning, Administration	City	2016
Continue enforcing seismic program &regulations in building codes	Seismic/Earthquakes	High/26	4	n/a	Building	All jurisdictions	2015 (ongoing)
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	Flood	High/21	4,7	n/a	Public Works, BJWSA, Planning	BJWSA, All jurisdictions	2015 (ongoing)
The City will undertake a program to study poorly drained areas and remedy them through best practices.	Flood	Medium/17	4,7	$20,000	Public Works, Planning	All jurisdictions (except HHI), HGMP, PDM, CDBG	2015 (ongoing)

City of Beaufort 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	All Hazards	Medium/18	5	n/a	Building	all jurisdictions	2015 (ongoing)
City will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Flood	High/20	5	unknown	SCDNR, FEMA, Planning, Building	County, SCDNR, PDM, HGMP	2015 (ongoing)
Work with the USACE and FEMA to develop new maps	Flood	High/20	5	unknown	FEMA, Planning, Building	County, SCDNR, PDM, HGMP	2015 (ongoing)
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Flood	High/25	4	n/a	Building	City	2015 (ongoing)
Train Building Officials on most up to date code requirements for hazard resistant construction	All Hazards	High/22	4,5	$5,000	Building	all jurisdictions, PDM, HGMP	2015 (ongoing)
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	All Hazards	High/21	3	$10,000	Building	City	2015 (ongoing)
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	All Hazards	High/20	4	$20,000	Building, Planning	All jurisdictions	2015 (ongoing)
Enforce property maintenance code to correct deteriorating conditions	All Hazards	Medium/16	4	n/a	Building	City	2015 (ongoing)
Create a joint permitting center for post-hazard recovery.	All Hazards	Medium/16	10	n/a	Building	City	2016

City of Beaufort 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Maintain or improve the City's CRS rating	Flood	Medium/16	4,7	n/a	Planning, Building	All jurisdictions	2015 (ongoing)
Explore the potential for solar installations on public facilities for backup emergency power	All Hazards	Medium/14	1	$50,000	Planning, Public Works	City, PDM	2018
Assist private home and business owners to obtain funding for retrofitting hazard prone buildings.	All Hazards	Medium/15	4	n/a	Planning	City, SCEMD, PDM	2016
Continue to develop the use of social media/smart phone technology to inform citizens of Hazard threats.	All Hazards	High/22	3,4	$5,000	EMD,EMS	All jurisdictions	2015 (ongoing)
Continue to develop to the National Standard for hazard planning and preparedness according the THIRA framework	All Hazards	High/24	4	n/a	EMD	City, PDM	2015 (ongoing)
Consider the adoption of the 1 ft. freeboard standard for new construction in floodplains.	Flood	Medium/15	4,7	n/a	Building, Planning	City	2016
Continue and enhance outreach efforts to local businesses, particularly hotels and assisted living facilities, to strengthen disaster preparedness.	All Hazards	High/21	3	n/a	EMD	City, COC	2015 (ongoing)
Formalize and streamline disaster response procedures across City departments. Coordinate planning and communication related to disaster preparedness.	All Hazards	High/26	4	n/a	All Departments	City	2015 (ongoing)
Consider the amendment of the City ordinance to allow for the temporary use of RV's and trailers for accommodation post-disaster.	All Hazards	High/22	4	n/a	Planning	City	2016

City of Beaufort 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Explore existing procedures for the suspension of electrical services following a mandatory evacuation.	All Hazards	High/27	4	n/a	EMD, SCE&G	City	2015
Updated GPS systems available for emergency personnel	All Hazards	Medium/19	5	$50,000	Fire, Building	PDM, HGMP, All jurisdictions	2016
The City will support ongoing efforts educate the public on the threat of Sea Level Rise and associated hazards, exploring best practices for adaptation to this threat.	Flood	High/22	3,4	n/a	Planning, Building, LCOG	All jurisdictions	2015 (ongoing)
The City will explore the development of a manual for stormwater BMP's.	Flood	Medium/17	4,7	$5,000	Planning, Building	City	2017

New and Ongoing Actions 2015, Town of Bluffton

Table 6-9: 2015 Actions Town of Bluffton

Town of Bluffton 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Protective measures on should be placed on all administrative buildings to ensure administrative functions can continue.	Thunderstorms, Hurricanes, tornadoes	High/20	1	$50,000	Building, Engineering, Planning, Public Works	PDM, HMGP, County and all municipalities	2015 (ongoing)
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	All Hazards	Medium/17	1	$20,000	Engineering, Fire District	County, PDM, HMGP	2015 (ongoing)
Study of vulnerable bridges to determine which ones should be hardened	Hurricane, Wind	Medium/15	1	unknown	SCDOT, Public Works, Planning, Engineering	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing as funds are available)
Maintenance and replacement of critical bridges	Hurricane, Wind, Earthquake	Medium/15	1	$5,000,000	SCDOT, Public Works, Planning, Engineering	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing as funds are available)
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Hurricanes	High/25	3	$5,000	Planning, Emergency Preparedness, Building	All Jurisdiction, PDM, HMGP	2015 (ongoing)
The town to work with Regional media to promote public awareness of disaster preparedness	All Hazards	High/24	3	$2,000	Planning, Building	County, all municipalities	2015 (ongoing)

Town of Bluffton 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Continue to support education programs to inform the community about the danger of land fires and resources on how to prevent them	Landfire	Medium/17	3	$5,000	Soil and Water District, Fire District,Planning	All Jurisdiction, PDM, HMGP, SCDNR	2015 (ongoing)
Continue tree survey for vulnerable trees to re-enforce them against hazards (wind, flood)	Flood, wind	Medium/17	6,7,4	$20,000	Planning	All jurisdictions, PDM, HMGP, SC Forestry Commission	2015 (ongoing)
Work to expedite re-build of historic structures post disaster	All Hazards	Low/8	4	$5,000	Building	All jurisdictions, HMGP	2015 (ongoing)
Continue enforcing seismic program &regulations in building codes	earthquakes	High/26	4	n/a	Building	All jurisdictions	2015 (ongoing)
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM project	flood	High/21	4,7	n/a	Public Works, BJWSA, Planning	BJWSA, all jurisdictions	2015 (ongoing)
The town will continue a program to study poorly drained areas and remedy them through best practices.	flood	Medium/17	4,7	$20,000	Public Works, Planning	All jurisdictions (except HHI), HGMP, PDM, CDBG	2015 (ongoing)
Updated GPS systems available for emergency personnel	All Hazards	Medium/19	5	$50,000	Emergency, Building	PDM, HGMP, All jurisdictions	2015 (ongoing)
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	All Hazards	Medium/18	5	n/a	Building	all jurisdictions	2015 (ongoing)

Town of Bluffton 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Enhance radio technology for all building officials for hazard preparation	All Hazards	Medium/17	5	$10,000	Building	all jurisdictions, PDM, HGMP	2015 (ongoing)
Town will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Flood	High/20	5	unknown	SCDNR, FEMA, Planning, Building	County, SCDNR, PDM, HGMP	2015 (ongoing)
Update all flood maps with new municipal and county boundaries	Flood	Medium/12	5	n/a	SCDNR, FEMA, Planning, Building	all jurisdictions	2015
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	Flood	High/25	4	n/a	Building	all jurisdictions	2015 (ongoing)
Train Building Officials on most up to date code requirements for hazard resistant construction	All Hazards	High/22	4,5	$5,000	Building	all jurisdictions, PDM, HGMP	2015 (ongoing)
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	All Hazards	High/20	4	$20,000	Building, Planning	All jurisdictions	2015 (ongoing)
Enforce property maintenance code to correct deteriorating conditions	All Hazards	Medium/16	4	n/a	Building	All jurisdictions	2016

Town of Bluffton 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Explore the service of special needs and other vulnerable populations for evacuation and sheltering.	All Hazards	Medium/17	2	n/a	Planning, EMD, EMS	All jurisdictions, PDM	2015 (ongoing)
Educate Bluffton staff and public on HM grant programs and funding opportunities.	All Hazards	High/24	3,4	n/a	Planning, Building	All jurisdictions	2016
The City will support ongoing efforts educate the public on the threat of Sea Level Rise and associated hazards, exploring best practices for adaptation to this threat.	Flood	High/22	3,4	n/a	Planning, Building, LCOG	All jurisdictions	2015 (ongoing)
Continue to develop the use of social media/smart phone technology to inform citizens of Hazard threats.	All Hazards	High/22	3,4	$5,000	EMD, EMS	All jurisdictions	2015 (ongoing)
Append this to all comprehensive plans as they are updated, or at earliest date available	All Hazards	High/27	3,4	n/a	Planning	All jurisdictions	2015 ongoing
Maintain or improve the City's CRS rating	Flood	Medium/16	4,7	n/a	Planning, Building	All jurisdictions	2015 (ongoing)

New and Ongoing Actions 2015, Town of Hilton Head Island

Table 6-10: 2015 Actions Town of Hilton Head Island

Town of Hilton Head Island 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Continue to conduct engineering inspections of fire stations as necessary to determine mitigation retrofitting measures necessary	All Hazards	Medium/17	1	$20,000	Engineering	Town CIP	2015 (ongoing)
Study of vulnerable bridges to determine which ones should be hardened and conduct maintenance of these bridges and HHI Causeways	Hurricane, wind, earthquakes	Medium/15	1	unknown	SCDOT, Engineering	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing)
HHI will work with regional media to promote public awareness of disaster preparedness.	All Hazards	High/24	2	$2,000	Community Development, Emergency Management	County, all municipalities	2015 (ongoing)
Distribute “Flood Hazards” brochure regularly.	Hurricane, flood	High/25	2,3	$10,000	Community Development	HHI	2015 (ongoing)
Hilton Head will continue to implement structural drainage projects.	Flood	High/27	7,10	$100,000	Community Development, Engineering	Hilton Head Island, HGMP, PDM	2015 (ongoing)
All communities to continue to support Beaufort Co.’s SWM Utility/plan for future SWM project.	Flood	High/21	7,10	n/a	All Departments	,all jurisdictions	2015 (ongoing)
Hilton Head will continue to maintain open space related to storm water management.	Flood	Medium/17	7	unknown	Community Development	Town of Hilton Head Island, PDM, HGMP	2015 (ongoing)

Town of Hilton Head Island 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Hilton Head will continue to perform periodic nourishment of its beaches.	Flood, Erosion	Medium/17	7	$17,000,000	Community Development, Public Projects & Facilities	PDM, HGMP, Town of Hilton Head	2015 (ongoing)
Conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget.	All Hazards	Medium/18	5	n/a	Emergency Management	all jurisdictions	2015 (ongoing)
Continue to work with SCDNR to update maps based on newer/more accurate topography data.	flood	High/20	7	n/a	SCDNR, Community Development	County, SCDNR, PDM, HGMP	2015 (ongoing)
Scan and store elevation certificates for convenience and ease of access on Town of Hilton Head Island website (although all written documents will be maintained).	flood	Medium/13	7	$10,000	Community Development, Records Dept., MIS Dept.	all jurisdictions, PDM, HGMP	2015 (ongoing)
HHI will continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	flood	High/25	7,4	n/a	Community Development	all jurisdictions	2015 (ongoing)
Continue to Train Building Officials on most up to date code requirements for hazard resistant construction.	All Hazards	High/22	6,7,4	$5,000	Community Development	all jurisdictions, PDM, HGMP	2015 (ongoing)

Mitigation Action	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Evaluate need to harden critical facilities (Town Hall, Fire and Rescue Headquarters and other critical facilities as listed in this plan) to reduce vulnerability to hazards.	All Hazards	High/21	1	$5,000	Public Projects & Facilities	HHI, PDM, HGMP	2016
Assist private home and business owners to obtain funding for retrofitting hazard prone buildings.	All Hazards	Medium/15	6,7	n/a	Community Development	CDBG, PDM, FMA	2015 (ongoing)
Educate HH staff and public on HM grant programs and funding opportunities.	All Hazards	High/24	6,7,4	$5,000	Community Development, County, LCOG	County, Municipalities, PDM	2015
Continue to develop the use of social media/smart phone technology to inform citizens of Hazard threats.	All Hazards	High/22	3,4	$5,000	EMD,EMS	All jurisdictions	2015 (ongoing)
Append this to all comprehensive plans as they are updated, or at earliest date available	All Hazards	High/27	3,4	n/a	Planning	All jurisdictions	2015 Ongoing
Maintain or improve the Town's CRS rating	Flood	Medium/16	4,7	n/a	Planning, Building	All jurisdictions	2015 (ongoing)
The Town will support ongoing efforts educate the public on the threat of Sea Level Rise and associated hazards, exploring best practices for adaptation to this threat.	Flood	High/22	3,4	n/a	Planning, LCOG	All jurisdictions	2015 (ongoing)

New and Ongoing Actions 2015, Town of Port Royal

Table 6-11: 2015 Actions Town of Port Royal

Town of Port Royal 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Protective measures should be placed on all administrative buildings to ensure administrative functions can continue.	Thunderstorms, Hurricanes, tornadoes	High/20	1	$50,000	Building, Engineering	PDM, HMGP, County and all municipalities	2017
Conduct engineering inspections of county fire stations to determine mitigation retrofitting measures necessary	All Hazards	Medium/17	1	$20,000	Engineering	County, PDM, HMGP	2017
Study of vulnerable bridges to determine which ones should be hardened	Hurricane, Wind	Medium/15	1	unknown	SCDOT, County Engineering, Planning	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing)
Maintenance and replacement of critical bridges	hurricanes, wind, earthquakes	Medium/15	1	$5,000,000	SCDOT, County Engineering, Planning	SCDOT, PDM, HMGP, County, municipalities, Federal Highways	2015 (ongoing)
Distribute “Citizen’s Guide to Flood Awareness” brochure regularly	Hurricanes	High/25	3	$5,000	Planning, Building	All Jurisdiction, PDM, HMGP	2015 (ongoing)
The town to work with Regional media to promote public awareness of disaster preparedness	All Hazards	High/24	3	$2,000	Planning, Administration	County, all municipalities	2016

Town of Port Royal 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Enhance programs dealing with drought, educating the public about proper water usage and appropriate behavior during drought conditions (to include distribution of drought education materials)	Drought	Medium/17	3	$3,000	Planning, Soil and Water District	All Jurisdiction, PDM, HMGP	2015 (ongoing)
Work to enhance public education program for historic property, including a pamphlet for distribution to the public	Flood, Seismic	Medium/14	3	$2,000	Planning	SHPO, all jurisdictions	2015 (ongoing)
Append this to all comprehensive plans as they are updated, or at earliest date available	All Hazards	High/27	3,4	n/a	Planning	All jurisdictions	2015
Make hazard mitigation a stand-alone element of comprehensive plans as updated	All Hazards	High/25	3	n/a	Planning	HHI	2019
Create tree survey for vulnerable trees to re-enforce them against hazards	Flood, Wind	Medium/17	4	$20,000	Planning, Building codes	Town, PDM, HMGP, SC Forestry Commission	2015 (ongoing)
Town will consider the use of priority development zones in non-hazard prone areas	Flood	Medium/13	4	n/a	Planning, Administration	County	2017
Create survey to ID most vulnerable public structures in Town and create a CIP list of these structures	Wind, Flood	Medium/17	1	$6,000	Planning	County	2016

Town of Port Royal 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Assist private home and business owners to obtain funding for retrofitting hazard prone buildings.	All Hazards	Medium/15	4	$200,000	USCB	SHPO, all jurisdictions, PDM, HMGP	2016
Work to expedite re-build of historic structures post disaster within historic building/remodeling guidelines.	All Hazards	Low/8	4	$5,000	Planning, Building	All jurisdictions, HMGP	2016
Continue enforcing seismic programs & regulations in building codes	Seismic/Earthquakes	High/26	4	n/a	Building	All jurisdictions	2015 (ongoing)
All communities to continue to support Beaufort Co.'s SWM Utility/plan for future SWM projects	Flood	High/21	4,7	n/a	Public Works, BJWSA, Planning	BJWSA, all jurisdictions	2015 (ongoing)
The town will undertake a program to study poorly drained areas and remedy them through best practices.	flood	Medium/17	4,7	$20,000	Planning	All jurisdictions (except HHI), HGMP, PDM, CDBG	2015 (ongoing)
Incentivize sharing of docks in zoning ordinances	Erosion	Medium/13	4,7	unknown	Planning	All jurisdictions	2016
Updated GPS systems available for emergency personnel	All Hazards	Medium/19	5	$50,000	Fire, Building	PDM, HGMP, All jurisdictions	2016

Town of Port Royal 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Town will conduct periodic surveys of the equipment used by emergency personnel and write the appropriations into their budget	All Hazards	Medium/18	5	n/a	Fire, Police, Building	all jurisdictions	2015 (ongoing)
Town will continue to work with SCDNR to update maps based on newer/more accurate topography data.	Flood	High/20	5	unknown	SCDNR, FEMA, Planning, Building	County, SCDNR, PDM, HGMP	2015
Update all flood maps with new municipal and county boundaries	Flood	Medium/12	5	n/a	SCDNR, FEMA, Planning, Building	all jurisdictions	2015
Continue to enforce floodplain regulations to ensure proper development in compliance with all building codes, FEMA regulations and any other pertinent ordinances.	flood	High/25	4	n/a	Building	all jurisdictions	2015 (ongoing)
Train Building Officials on most up to date code requirements for hazard resistant construction	All Hazards	High/22	4	$5,000	Building	all jurisdictions, PDM, HGMP	2015 (ongoing)
Sponsor and conduct workshops for local engineers, architects and contractors on IBC and hazard resistant construction	All Hazards	High/21	3	$10,000	Building	all jurisdictions, PDM, HGMP	2015 (ongoing)

Town of Port Royal 2015 Mitigation Actions	Associated Hazards	Priority/Score	Associated Goal (number)	Estimated Cost	Department	Potential Funding	Implementation Schedule
Actively advocate to public officials the adoption of the latest version of universally accepted building codes without amendments	All Hazards	High/20	3,4	$20,000	Planning, Building	All jurisdictions	2015 (ongoing)
Enforce property maintenance code to correct deteriorating conditions	All Hazards	Medium/16	4	n/a	Building, Codes, Planning	All jurisdictions	2015 (ongoing)
Create a joint permitting center for post-hazard recovery.	All Hazards	Medium/16	4	n/a	Building	all jurisdictions	2017
The City will support ongoing efforts educate the public on the threat of Sea Level Rise and associated hazards, exploring best practices for adaptation to this threat.	Flood	High/22	3,4	n/a	Planning, Building Codes	All jurisdictions	2015 (ongoing)
Continue to develop the use of social media/smart phone technology to inform citizens of Hazard threats.	All Hazards	High/22	3,4	n/a	EMS	All jurisdictions	2015 (ongoing)
Maintain or improve the City's CRS rating	Flood	Medium/16	4,7	n/a	Planning, Building	All jurisdictions	2015 (ongoing)

Actions Incorporated into the Mitigation Plan and Implementation

The mitigation action matrix table reflects the prioritization that was conducted by the Hazard Mitigation Steering Committee, as well as significant input from other regional stakeholders during development of the Hazard Mitigation Plan. That table contains the most up-to-date information regarding mitigation actions. The proposed actions discussed in this section are specific mitigation actions and projects being considered to reduce the effects of each hazard pursuant to federal regulations.

Each proposed mitigation action was subjected to a review and analysis by the Hazard Mitigation Steering Committee, as mentioned previously. The purpose of this review and analysis is to ensure that an initiative proposed by a participating organization or community group is based on an adequate level of technical analysis, that all needed information about the proposal is presented, that any assumptions utilized are reasonable and logical, that the proposal is consistent with the goals and objectives of the Hazard Mitigation Steering Committee, and that it is addressing identified vulnerabilities of the community or shortfalls in the communities' mitigation policy framework. More specifically, the review and analysis process is focused on ensuring the technical validity of the proposal, making a judgment whether the initiative would be technically effective and cost-beneficial, if it is duplicative or in conflict with other proposed initiatives, or if its implementation would have an adverse effect on another jurisdiction.

All actions were proposed by the committee, assembled and sent to the members for review and comment. Over the course of several meetings, the list of action items was refined, shortened and crafted for viability. The Hazard Mitigation Steering Committee then reviewed the proposal for any other concerns, such as its consistency with other plans, political and community objectives. By doing this thorough review of the actions, the plan reflects the values of the community.

All of the actions listed in this plan have been approved by the Hazard Steering Committee. An approved mitigation action is one that has been fully reviewed and deemed acceptable to be incorporated in the Hazard Mitigation Plan. However, it is appropriate to report that many of the actions from the previous plan were completed, and the following chart reports the progress of the actions and goals of the previous plan:

The Mitigation Action Matrix Table lists actions that are currently in the Beaufort County Hazard Mitigation Plan and their priority scores. Again, the priority scores are based on 10 separate prioritization criteria used by all of the planning participants to allow the Beaufort County Hazard Mitigation Steering Committee to compare various mitigation actions. The specific priority scores are based on a numeric classification system shown in table 6-1.

Implementation through Existing Plans and Programs

One of the methods to most effectively implement the Beaufort County Hazard Mitigation Plan is to propose and implement actions that will modify other community plans, policies,

and programs. By including personnel from a variety of departments in the hazard mitigation planning process, concepts derived from the planning process will be spread throughout County departments such as; public works, storm water management, GIS, and planning. Mitigation activities initiated by this plan have been incorporated into the Community Rating System (CRS) plan and vice versa. Furthermore, as is discussed in the community capability portion of this plan, other planning documents should reflect the objectives of the Hazard Mitigation Plan. Beaufort County and its municipalities are committed to hazard mitigation, and it is shown that some comprehensive plans include the Hazard Mitigation Plan by reference.

Continued Public Involvement

The Hazard Mitigation Steering Committee will continue efforts to develop and implement a year- round program to engage the community in the mitigation planning process and to provide them with mitigation-related information and education. These efforts will be to continually invite public comments and recommendations regarding the mitigation goals for the community, the priorities for the planning, and the unique needs of each community for mitigation-related public information.

Public information activities that have been completed or are planned by the organizations making up the Beaufort County Hazard Mitigation Steering Committee are listed in Section 5 of this plan. Each of these activities continues to engage the community in the planning process through the presentation of a specific topic or program related to, or relevant for, hazard mitigation.

The Next Planning Cycles

As given in this section, the Beaufort County Hazard Mitigation Steering Committee has established a schedule and procedure for both plan implementation and plan maintenance that is expected to be very helpful in improving and expanding the mitigation planning process. In addition to these activities for plan maintenance, the Hazard Mitigation Steering Committee will establish a recommended schedule for implementation of the proposed priority initiatives included in this edition of the plan. It is expected that the agencies and organizations that sponsored these initiatives for the plan will, during the next planning cycles, take advantage of timely opportunities and available resources to implement them on the desired schedule, if it is possible to do so.

The Beaufort County Hazard Mitigation Plan is a dynamic document, reflecting a continuing, and expanding planning process. The efforts of the Hazard Mitigation Steering Committee will continue into the future, striving to make all of the jurisdictions of Beaufort County truly disaster resistant communities.

Idealized Schedule of Implementation

The Mitigation Action Matrix Table in this section also includes an ideal schedule of implementation of the action items. This time-table is based on the Hazard Mitigation Steering Committee's knowledge of the feasibility of completion.

Monitoring, Evaluating, and Updating the Plan

Beaufort County (Unincorporated, City of Beaufort, Town of Bluffton, Town of Hilton Head Island and the Town of Port Royal) has developed a method to ensure that regular review and update of the Hazard Mitigation Plan occurs.

Plan Maintenance

The HMSC will meet once a year as coordinated with the participating communities and their local governing bodies. At this meeting, the Committee will review the plan to determine if the information is up to date and should be updated or modified. The parties responsible for implementing action items detailed in Chapter 6 of the plan will report on the status of their projects. The chairman will be responsible for updating the Hazard Mitigation Plan to reflect the progress made of the annual meeting.

The Committee may choose to meet more often as the need requires such as if there is a change in State or federal policy or after disasters affect the County. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies outlined in the Plan.

The Committee will be responsible for ensuring that updated copies of the plan are made available at the Beaufort County Administrative Building (Building Codes or Planning Department). If deemed necessary and appropriate, a public meeting will be held after each annual Hazard Mitigation Steering Committee meeting. This meeting will provide the public an opportunity to ask questions about the progress of the items in the Action Plan (Chapter 6) as well as make suggestions for updates to the plan.

Updating the Plan

No later than five years from now, the Committee (or designated appointees) will meet in order to conduct the FEMA required five-year update of the plan. The next planned update to this plan will be in 2020.

7. References (includes original plans references and any updates)

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Appendix A

Lowcountry Hazard Mitigation Plan Update: Steering Committee Meeting #1, Thursday, February 5, 2015, 10:30 a.m. Location: LCOG Boardroom

Attendees

Katie Norris	SCEMD
Charlotte Norris	SCEMD
Suzanne Gant	Colleton County EPA
Sirena Memminger	Colleton County EPA
Wilbur A. Daley	Jasper County ES
Russell Wells	Jasper County ES
Chris Altman	Hampton County Emergency Services Director
Greg Cook	Hampton County Fire/Rescue
Susanne D. Peeples	HC EMD
Chuck Atkinson	Beaufort County
John Webber	Beaufort County

Meeting Summary

Since we focused our attention—very productively--on revising the Goals and Objectives (below) to bring them up to date and to better meet everyone's current and future needs, the following section takes the place of standard meeting notes. The yellow highlighted sections are the changes that were developed through our discussions.

Goals and Objectives Review and Revision

As with the previous update, the planning process will include a review of whether and how well the goals and objectives developed in 2010 have been met and whether and how they need to be modified, updated or removed/replaced. Those goals and objectives are:

Overall Guiding Principles:

- Bridging the unique needs and common goals of the four counties and their communities.
- Saving lives and protecting property.
- Taking a regional approach.
- Complementing the State Plan.
- Accessing funding to implement recommendations (projects and policies).

Goal #1 Ensure the Protection of All Critical Facilities.

Objectives

a. Protect facilities from natural hazard threats.

b. Identify and schedule repairs and other improvements needed in order to ensure buildings are in adequate conditions and with adequate equipment to function in the event of a disaster.

Goal #2 Evacuation is safe, efficient, and shelters have sufficient carrying capacity.

Objectives

a. Evacuation routes should be proven safe and efficient. Counties work with each other and SCDOT on highways connecting the counties

b. The number of area shelters should be adequate and safe for the amount of people that may potentially use them. The shelters should be able to accommodate all members of the area's population, including those with special medical or other needs.

Goal #3 Increase Public Education and Awareness of Natural Hazards

Objective

c. Develop an ongoing public communications and education program including a web site, pamphlets, informational packets, and articles in the local media.
d. Incorporate the use of social media, including Facebook ™ and Twitter™ to ensure that as many segments of the population as possible are reached.

Goal #4 Enhancement and Adoption of New Policies and Projects to Mitigate Natural Hazards

Objective

a. Plans, codes, zoning, and other mechanisms should address natural hazard mitigation, and expand on present policies to further protect the counties and incorporated municipalities (floodplains, repetitive loss areas, etc). All jurisdictions should adopt the state building code.

Goal #5 Emergency Response: Preparedness EMS, police, fire, and other departments should have sufficient and up to date equipment and training in order to ensure the safety of residents.

Objectives

c. There should be funding to buy new equipment (e.g., communications and power) if necessary.
d. There should be funding to train employees if necessary.
e. Maintain and enhance working relationships among the departments among all four counties.
f. Coordinate with the county and regional offices of the various state human services departments.

Goal #6 Reduce the Impact of Wind on Homes and Buildings. Wind damage is a threat to homes and buildings in the region. Means should be taken to decrease the effects of wind on homes and buildings within the counties.

Objectives

c. Code revisions to reduce the impact of wind on homes and buildings.
d. Grants, including SC Safe Homes, for preventative measures (such as housing grants).

Goal #7 Reduce the Impact of Floods on Homes and Buildings. Projected sea-level rises in the Lowcountry will be included, utilizing such information and mapping as is currently available to help determine the areas and magnitude of impacts.

Objectives

a. Zoning enforcement, floodplains.

b. Grants for preventative measures, to include elevation and property acquisition.

c. Building code revisions

d. Stormwater management

e. Work toward the lowering of the CRS rating.

Goal #8 ~~Ensure~~ Maintain the ~~Safety of Data.~~ IT capabilities of local governments to ensure continuity of operations in the event of disaster

Objective

~~a. Provide the counties and municipalities with the technology, equipment and training to back up important files.~~

c. Support the use of centralized technology, located as far inland as possible.

d. Develop a hosted (for instance, the "cloud") storage system.

Goal #9 Ensure the Protection and Continued and Uninterrupted Operation of Communications on a regional basis

Objective

~~a. Communication lines should be frequently inspected and their capability and vulnerability assessed.~~

c. Determine if the current regional communications infrastructure is adequate to meet the needs.

d. Identify what improvements are needed.

Goal #10 Ensure the Protection of Utilities

Objective

b. Utilities must be inspected and assessed of their capability and vulnerability to handle natural disasters.

This plans update will do a similar assessment and revision of implementation/action projects and activities undertaken since 2010.

MEETING NOTES
Hazard Mitigation Steering Committee
Meeting of the Policy Committee
Thursday, September 24, 2015 – 10:00 a.m.
Lowcountry Council of Governments Boardroom

Attendees
Beaufort County Staff
Eric Larson-Director of Environmental Engineering
Colleton County Staff
Suzanne Gant-Emergency Manager
Hampton County Staff
Chris Allman-Director of Emergency Services
Blake Hodges-Director of Public Works
Jasper County Staff
Russell Wells-Deputy Director of Emergency Services
Town of Hilton Head
Marcy Benson-Senior Grants Administrator
South Carolina Emergency Management Department
Andrew Phillips-Hazard Mitigation Specialist
LCOG Staff
Ginnie Kozak-Planning Director
Jonathan Sherwood-Community and Regional Planner
Lawrence Holdsworth-Regional Planner

1. **Welcome and Introduction of Members**
2. **Progress Report on Plan Updates and Presentations on Three-Counties and Beaufort County Plans.**
    a. Mr. Holdsworth and Mr. Sherwood gave presentations on the plan updates including an overview of FEMA plan requirements, updated economic, demographic, and meteorological data, information regarding the previous plan's recommendations, and updated goals and actions for the new plans.
    b. Mr. Allman posed the question of whether the Hazus-MH software could distinguish between properties that had or had not obtained flood insurance. Mr. Phillips responded that due to matters of privacy, this data could not be provided for analysis.
    c. Ms. Gant indicated interest in obtaining the number of buildings contained in flood zones. Mr. Sherwood said this was possible, and provided the approximate number of buildings for Colleton County.

d. Mr. Phillips described the limitation of the Hazus software in predicting the damage from storms when it is applied strictly according to the Saffir-Simpson Hurricane rating scale. He related that the size of the storm in area, as well as the tide level on landfall can be highly influential in the storm's impact.

e. Mr. Allman suggested the SCEMD Hurricane model as a valuable resource for predicting the extent of storms. Ms. Kozak responded that future meetings of the group could cover more technical aspects, including various approaches to modeling different hazards.

f. Mr. Wells confirmed the accuracy of the wildfire ignition density map from Mr. Sherwood's presentation, informing the group that there is a proactive regime of prescribed burning occurring in Jasper County. Mr. Allman offered that the Clemson Extension has been integral to these efforts. Mr. Hodges described the accumulation of broomstraw as a potential risk factor for wildfire ignition. Ms. Gant commented that her office is typically not involved with wildfire prevention measures.

3. **Review of Local Government Consultations**.

a. Lists of contacts made by LCOG during the planning process were distributed to the attendees. No additions to the list were recommended.

4. **Review of Public Involvement Process: Preliminary Result of Survey**

a. Ms. Kozak described the need to reconsider the public involvement strategy for this planning process considering the sparse attendance at previous HMP public meetings. She noted that this experience has resulted in the current emphasis on electronic communication through Survey Monkey and social media, while using local newspapers and individuals to spread the word about the survey.

b. Mr. Sherwood updated the group on the preliminary number of survey responses gathered through Survey Monkey. Mr. Sherwood said the majority of responses had come thus far from Beaufort County, and that LCOG would need the help of this group to distribute the survey within their jurisdictions.

c. Ms. Gant volunteered that she had contacts that could help distribute surveys to populations that may not easily be reached through electronic means. Mr. Sherwood and Ms. Kozak suggested that LCOG could assist in providing paper surveys for Colleton County.

5. **Review of Action Recommendations.**

a. Mr. Holdworth related the potential for regional collaboration in providing a storage facility for donated emergency supplies. Mr. Wells said there are plans already in motion to provide such a facility in Jasper County, with several sites under consideration. He described the

potential for this facility to be a location for emergency generators, another identified mitigation area. Mr. Allman said that Hampton County is planning for the use of an industrial site south of Varnville on Highway 278 for storage of emergency supplies. Mr. Allman described the generator issue as one of statewide concern, and suggested that there could be initiatives to approach it at that scale.

b. Ms. Gant said that since the 2009 plan, Walterboro and Colleton County emergency dispatches had been consolidated.
c. Mr. Allman reported that the County now had paid firefighters Monday through Friday.
d. Mr. Sherwood recommended further engagement with the faith-based community in coordinating disaster response. Ms. Gant responded that there are existing SCEMD and Army Corps projects engaging civic associations, providing supplies and training from the Red Cross. Mr. Wells offered that religious affiliation requires consideration for sheltering post-hazard due to differences in customs. He indicated that further exploration of faith based groups for assistance with sheltering may improve the experience for evacuees with specific needs for accommodation.
e. Mr. Sherwood proposed the use of intelligent traffic systems to reduce congestion in evacuation. Mr. Wells expressed concern over the lack of road widening on key evacuation routes such as 278, especially with the expanding population and industry in Southern Beaufort and Jasper County. Mr. Allman suggested that reversing lanes along key corridors could alleviate congestion, but is prohibited by SCDOT. Ms. Kozak said SCDOT designates major highways as evacuation routes, which may restrict the areas ability to consider alternatives.
f. Mr. Allman broached the issue of a pending agreement between the counties and SCDOT for the clearance of debris on state roads. Mr. Wells expressed concern over the terms of reimbursement for work completed. Mr. Larson emphasized the need for a coordinated approach between the counties in responding to the issue. Mr. Allman related that following a recent ice storm, Hampton County crews crossed county boundaries to bring SCE&G trucks to restore service, demonstrating the point that debris removal must be approached regionally. Mr. Hodges related the fact that for FEMA reimbursement, the regional approach must be codified, otherwise work done in other counties will not be reimbursed. Ms. Kozak suggested that LCOG could play a role in bringing the counties, SCDOT and SCEMD together in a meeting to discuss future agreements for service provision. Kozak went on to stress the importance of this issue

for the region for its relevance to issues beyond transportation. Mr. Allman recommended that an investigation of a mutual assistance agreement for debris removal could be incorporated into the HMP as a mitigation action.

g. Mr. Allman offered another example of how the counties are working together to provide services and reduce hazard vulnerability. Allman described the fiber optic loop that connects the emergency dispatches and EOC's of Beaufort, Hampton, and Jasper. The provision of this connection ensures the continued operation of communications between facilities in the event of a disruption at a single location. Ms. Gant expressed interest in the potential of Colleton County becoming connected to this service.

h. Mr. Allman commented that there are significant opportunities for grant funding through DHEC. Mr. Wells indicated the potential benefit of a regional grant writer to explore opportunities for funding cross-jurisdictional projects. Mr. Wells explained further that applications for regional projects rise quickly in the application process compared to those oriented to more parochial interests.

6. Schedule for Completion and Submission to SCEMD

a. Ms. Kozak said the three-county plan was in the process of final revisions. Mr. Holdsworth suggested that a first draft of Beaufort County plan could be expected in the coming weeks.

Lowcountry Council of Governments

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AGENDA

LOWCOUNTRY COUNCIL OF GOVERNMENTS BOARD OF DIRECTORS MEETING
THURSDAY, OCTOBER 22, 2015
6:30 P.M.
POINT SOUTH, SOUTH CAROLINA

Fellowship begins at 6:00 p.m.

1. Call to Order
   - 1.1. Pledge of Allegiance
   - 1.2. Invocation
   - 1.3. Introduction of Guests and Staff
   - 1.4. Proxies
   - Action 1.5. Approval of September 24, 2015 Minutes *
   - Action 1.6. Approval of 2016 Meeting Schedule *
2. Presentation
   - 2.1. Presentation of the LCOG Agency Audit for Fiscal Year Ending June 30, 2015 – Lisa Wechsler *
3. Reports
   - 3.1. Finance Report for September 2015 – Sherry Smith
     Report to be distributed during the meeting
   - 3.2. Community and Economic Development Report– Michelle Knight *
   - 3.3. Director's Report – Sabrena Graham *
   - 3.4. Planning Report – Ginnie Kozak
     - 3.4.1. Update on Hazard Mitigation Plan
     - 3.4.2. SCDOT Quarterly Report – For information
     - 3.4.3. The People and the Economy of the Lowcountry Report *
     - 3.4.4. 208 Report – For information *
     - 3.4.5. Regional Unemployment Chart – For information *
4. Council Time

Action 5. Adjourn

* attachment

Serving **Beaufort • Colleton • Hampton • Jasper** *Counties*

APPENDIX B
SIGN IN

Hazard Mitigation Steering Committee
September 25, 2015

Name	Jurisdiction/Organization
Chris Allman	Hampton County.
RUSSEL WELLS	JASPER COUNTY
Suzanne Hart	Colleton County
Eric Larson	Beaufort Co.
MARCY BENSON	Town of Hilton Head Island
Slade Hedg	Hampton County

LOWCOUNTRY COUNCIL OF GOVERNMENTS
Board Meeting
ATTENDANCE, MILEAGE AND PROXY INFORMATION

Date of Meeting: October 22, 2015

Board Member	Attended Meeting (Please Sign)	Proxy for (Print Name)	Mileage Reimbursement (Fill In Round Trip Miles To Request Payment)
Beaufort County			
Phil Cromer	Phil Cromer		
Gerald Dawson	Gerald Dawson/CS		on file.
Brian Flewelling	[illegible]		on file
Herbert Glaze	Herbert Glaze		
Marc A. Grant			
Mary Beth Heyward			
Alice Howard			
Bill McBride	Bill McBride		on file
Joseph McDomick	J. McDomick		
Jerry Stewart	[illegible]		on file
Lisa Sulka			
Colleton County			
Esther S. Black	Esther S. Black		
Bobby Bonds	Bobby Bonds		on file
Jane Darby			
Joseph Flowers	[illegible]		on file
Tommy Mann			
Evon Robinson			
Gene Whetsell	[illegible]		
Hampton County			
Frankie Bennett	[illegible]		on File
Pete Hagood	P. Hagood		on File
Pete Mixson	Pete Mixson		on File
Buddy Phillips	Buddy Phillips		on file
Nat Shaffer			
Jasper County			
Henry Etheridge			
Henry Lawton	H. C. Lawton Jr.		
Joey Malphrus	[illegible]		
Gwen Smith	Gwen Smith		on file
Michael Sweeney	[illegible]		67 miles

Appendix C

USC Hazards and Vulnerability Research Institute SoVI Factors
http://webra.cas.sc.edu/hvri/products/sovifaq.aspx

Demographic Factors and Social Vulnerability

Socioeconomic Status (Income, Political Power, Prestige): Socioeconomic status affects the ability of a community to absorb losses and be resilient to hazard impacts. Wealth enables communities to absorb and recover from losses more quickly using insurance, social safety nets, and entitlement programs.

High status (-) Low income or status (+)

Gender: Women often have a more difficult time during recovery than men because of sector-specific employment (e.g., personal services), lower wages, and family care responsibilities.

Gender (+)

Race and ethnicity: These factors impose language and cultural barriers and affect access to post-disaster funding and occupation of high-hazard areas.

Non-white (+) Non-Anglo (+)

Age: Extremes of age affect the movement out of harm's way. Parents lose time and money caring for children when day care facilities are affected; the elderly may have mobility constraints or concerns that increase the burden of care and lack of resilience.

Elderly (+) Children (+)

Employment loss: The potential loss of additional employment following a disaster increases the possible number of unemployed workers in a community. Such losses contribute to a slower recovery from the disaster.

Unemployment (+)

Rural/Urban: Rural residents may be more vulnerable because of lower incomes and more dependence on a locally based resource economy (e.g., farming or fishing). High-density areas (urban) complicate evacuation out of harm's way.

Rural (+) Urban (+)

Residential property: The value, quality, and density of residential construction affect potential losses and recovery. Expensive homes on the coast are costly to replace, mobile homes are easily destroyed and less resilient to hazards.

Mobile homes (+)

Renters: People rent because they are transients, do not have the financial resources for home ownership, or do not want the responsibility of home ownership. They often lack access to information about financial aid during recovery. In extreme cases, renters lack sufficient shelter options when lodging becomes uninhabitable or too costly to afford.

Renters (+)

Occupation: Some occupations, especially those characterized as primary extractive industries, may be severely affected by a hazard event. Self-employed fishermen suffer when their means of production is lost, and they may not have the requisite capital to resume work in a timely fashion; therefore, they may seek alternative employment. Migrant workers engaged in agriculture and low-skilled service jobs (housekeeping, child

care, and gardening) may suffer similarly as disposable income fades and the need for services declines. Immigration status also affects occupational recovery.

Professional or managerial (-) Clerical or laborer (+) Service sector (+)

Family structure: Families with large numbers of dependents and single-parent households often have limited wherewithal to outsource care for dependents and thus must juggle work responsibilities and care for family members. All these factors affect resilience to and recovery from hazards.

Large families (+) Single-parent households (+)

Education: Education is linked to socioeconomic status in that higher educational attainment affects lifetime earnings, and limited education constrains the ability to understand warning information and access recovery information.

Little education (+) Highly educated (-)

Medical Services: Health care providers, including physicians, are important post-event sources of relief. The lack of proximate medical services lengthens the time needed to obtain short-term relief and achieve longer-term recovery from disasters. Hospitals and nursing homes represent an increase in socially vulnerable people as the residing populations are less able to independently cope with disasters.

Higher density of medical (-), nursing homes (+), hospitals (+)

Social dependence: People who are totally dependent on social services for survival are already economically and socially marginalized and require additional support in the post-disaster period.

High dependence (+) Low dependence (-)

Special-needs population: Special-needs populations (infirm, institutionalized, transient, homeless) are difficult to identify, let alone measure and monitor. Yet it is this segment of society that invariably is left out of recovery efforts, largely because of this invisibility in communities.

Large number of special needs (+) Small number of special needs (-)

APPENDIX D
SURVEY

Survey Development and Distribution

The survey was developed referencing previous surveys conducted by LCOG, as well as surveys included in Hazard Mitigation Plans nationwide. The length of the survey was kept short to maximize convenience and encourage responses. Rather than attempting to duplicate existing sources of data, questions were designed to assess personal experiences and perceptions of natural hazards, individual planning and preparation, as well as support of community-wide mitigation strategies.

The survey was designed and largely distributed through Survey Monkey, an online service that allows users to send/post links by which respondents can access the survey online. Several hundred copies were also printed to capture respondents that may not have web access. Many local leaders distributed the survey link and instructions via email blasts, social media, or posting on local government webpages. For example, Mayor Keyserling of the City of Beaufort sent a link to the survey in his weekly newsletter to residents. Colleton County officials provided paper copies of the survey to residents applying for relief funds following the recent flooding of the Edisto River.

Example of Survey Posting on Hilton Head Island Homepage

Town of Hilton Head Island
Beaufort County, South Carolina

Employment Opportunities | Topic Index | Contact Us

E-Subscription Service

Search hiltonheadislandsc.gov

Government | Online Services | Departments | Our Island | Public Safety | Publications

Text Size: A A A

Regional Hazard Mitigation Plan Survey

The Lowcountry Council of Governments (LCOG) is currently updating the Pre-Disaster Hazard Mitigation Plans for Beaufort, Colleton, Hampton and Jasper counties as required every five years by FEMA and the South Carolina Emergency Management Division (SCEMD) "to reflect changes in development, progress in local mitigation efforts, and changes in priorities,...". FEMA, through SCEMD, is funding the majority of the cost of the work; the counties are all providing their shares of the required local match.

The original plans were prepared approximately 10 years ago, and the first updates were completed in 2010 for all four counties by LCOG.

Although detailed goals and objectives have changed over time, the Overall Guiding Principles have stayed the same, including:

- Saving lives and protecting property.
- Accessing funding to implement recommendations (projects and policies).

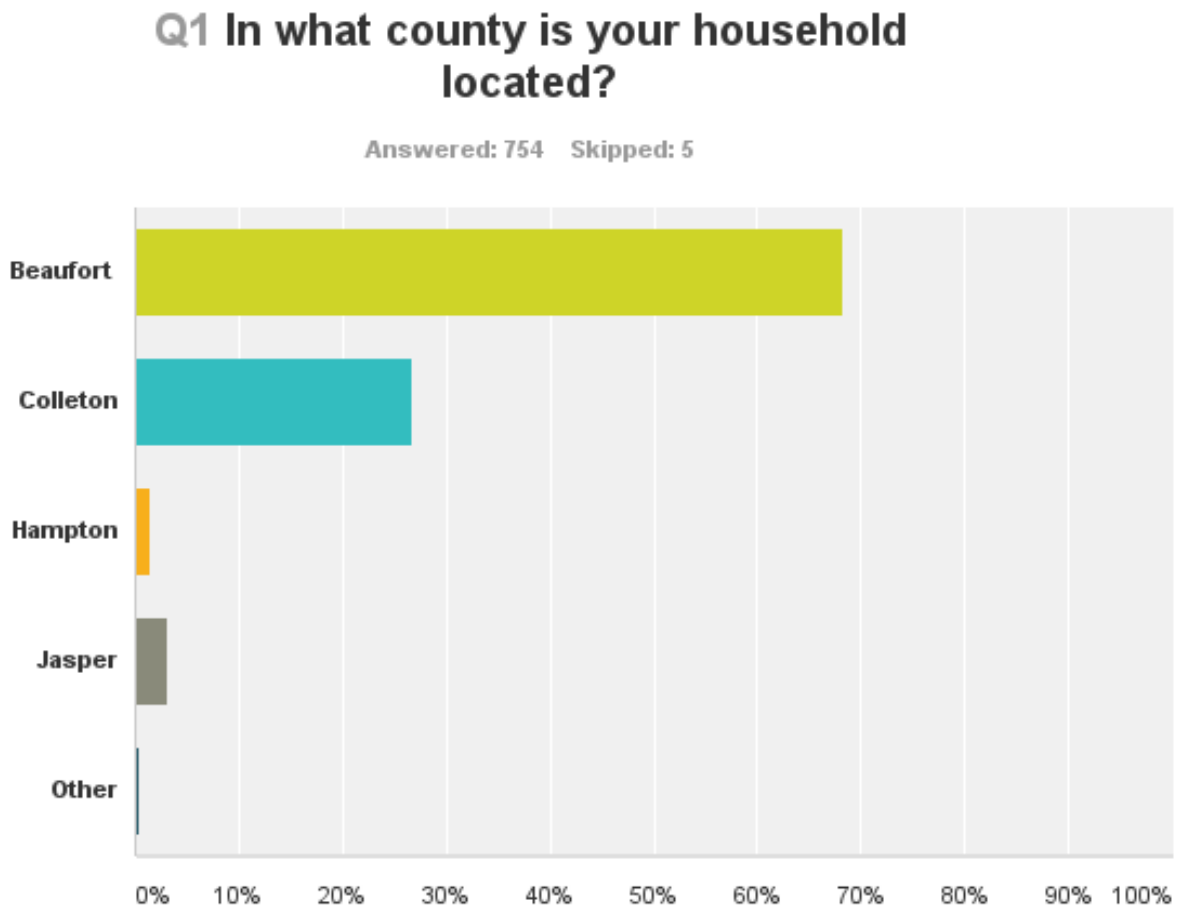
Lowcountry residents have the opportunity to take part in the planning to prevent major property damage and other losses caused by natural disasters. Risks and hazards—including wind, wildfires, ice storms and flooding—have been identified and assessed. The next step requires structuring a list of possible action steps to help mitigate any damage caused by these and other hazards. Suggestions, comments and questions from area residents will ensure that all members of the community are represented and no concerns are overlooked. LCOG has prepared a very brief survey that will only take a few minutes to complete. Follow this link to access the short questionnaire: https://www.surveymonkey.com/r/lcoghazardsurvey

If you have any questions or would like hard copies of the survey, please contact Jonathan Sherwood or Lawrence Holdsworth at 843-726-5536, or jsherwood@lowcountrycog.org or lholdsworth@lowcountrycog.org.

For ongoing information about the project, check with our Facebook Page:
https://www.facebook.com/LowcountryNaturalHazardPlanning

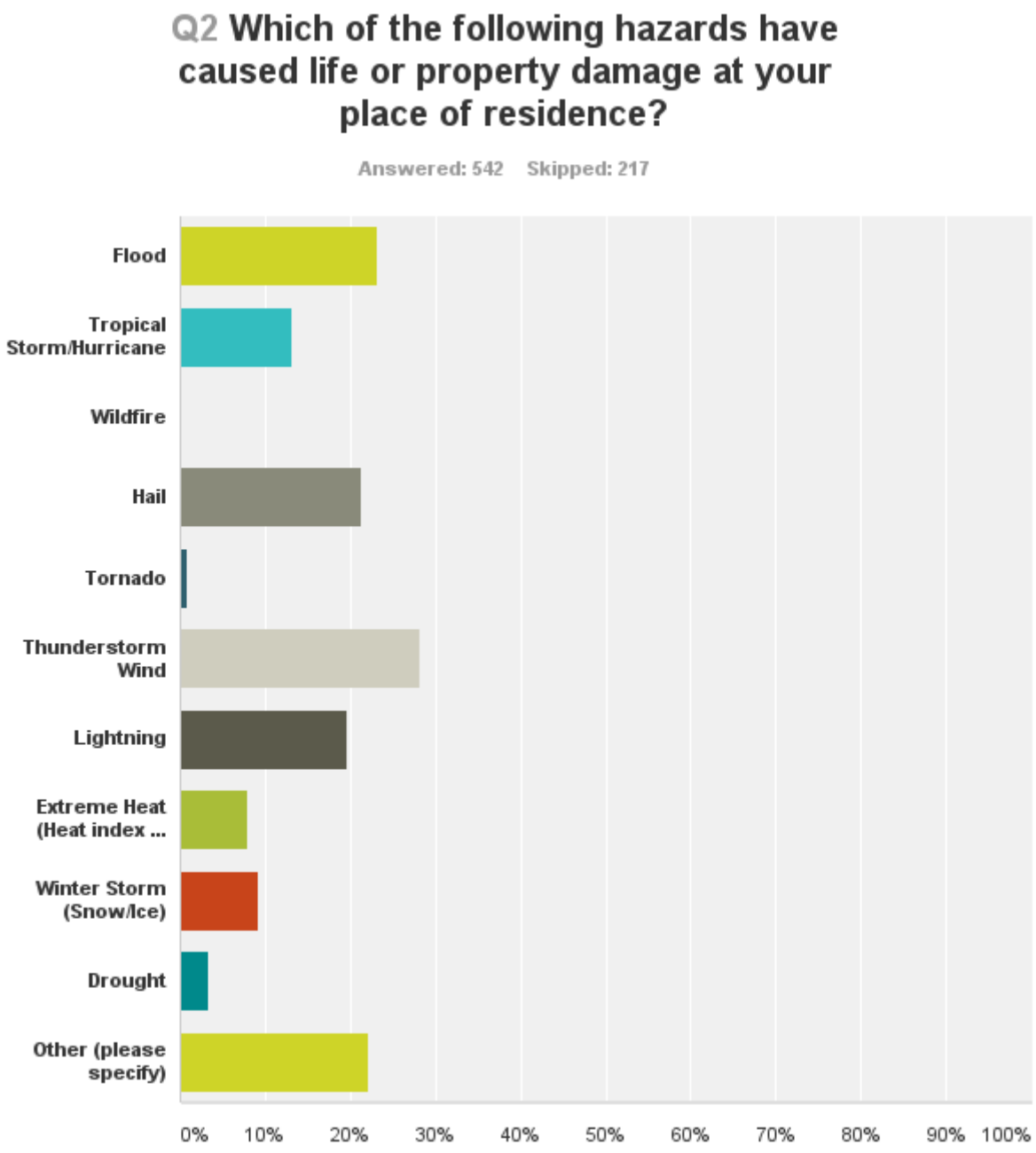
Results and Analysis

Question 1.



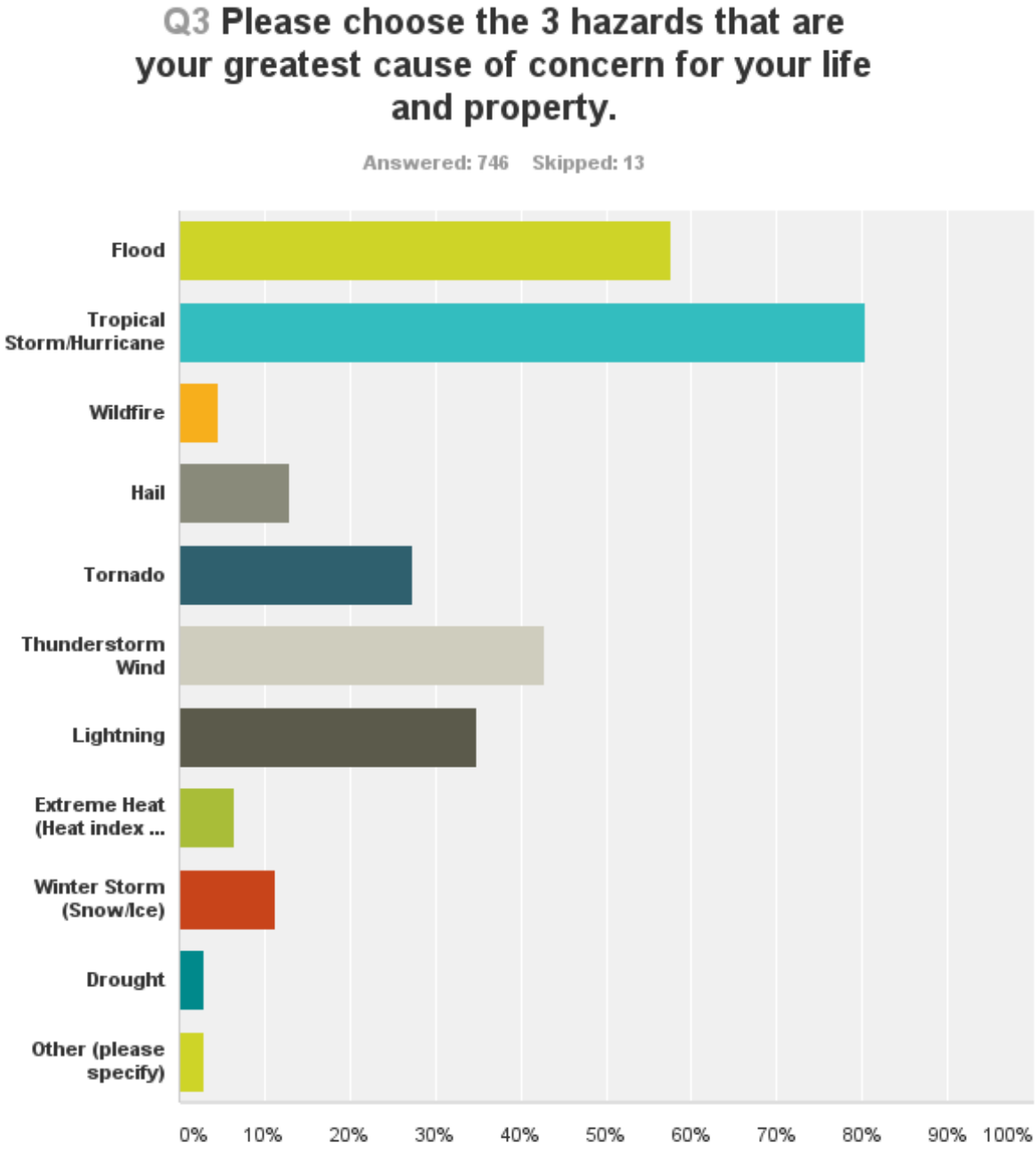
Over 750 survey responses were collected over the period of 2 months. The vast majority of survey respondents were located in Beaufort County, where population is most concentrated in the region. Colleton County recorded a significant number of responses as survey collection coincided with the collection of documents for FEMA reimbursement following the flooding of the Edisto River. The significant amount of coastline and/or extensive hydrological networks in these counties may contribute to the heightened public awareness of, and interest in hazard threats.

Question 2



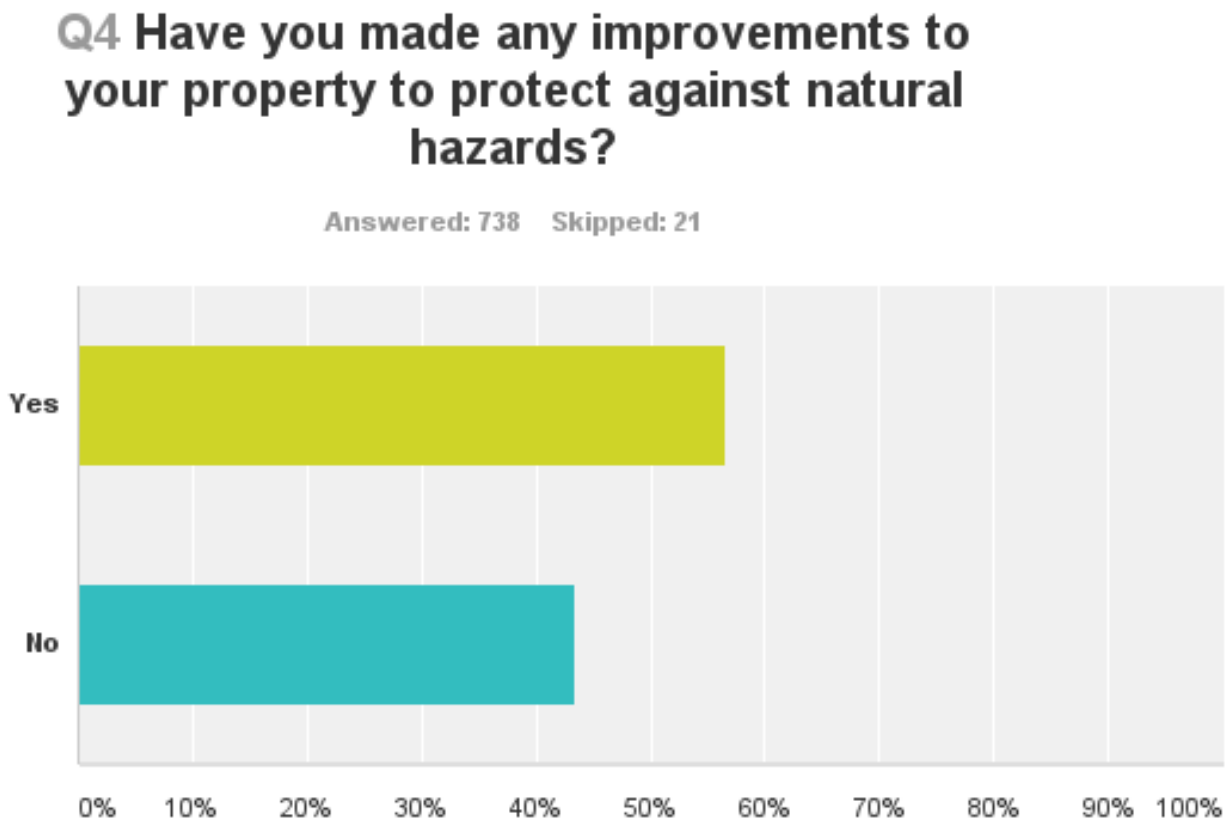
The most frequently cited hazards to cause damage to property for Lowcountry householders correlate highly with the frequency by which these events occur. Hail, flood, thunderstorm wind and lightening were top contributors to property damage or injury among respondents.

Question 3.



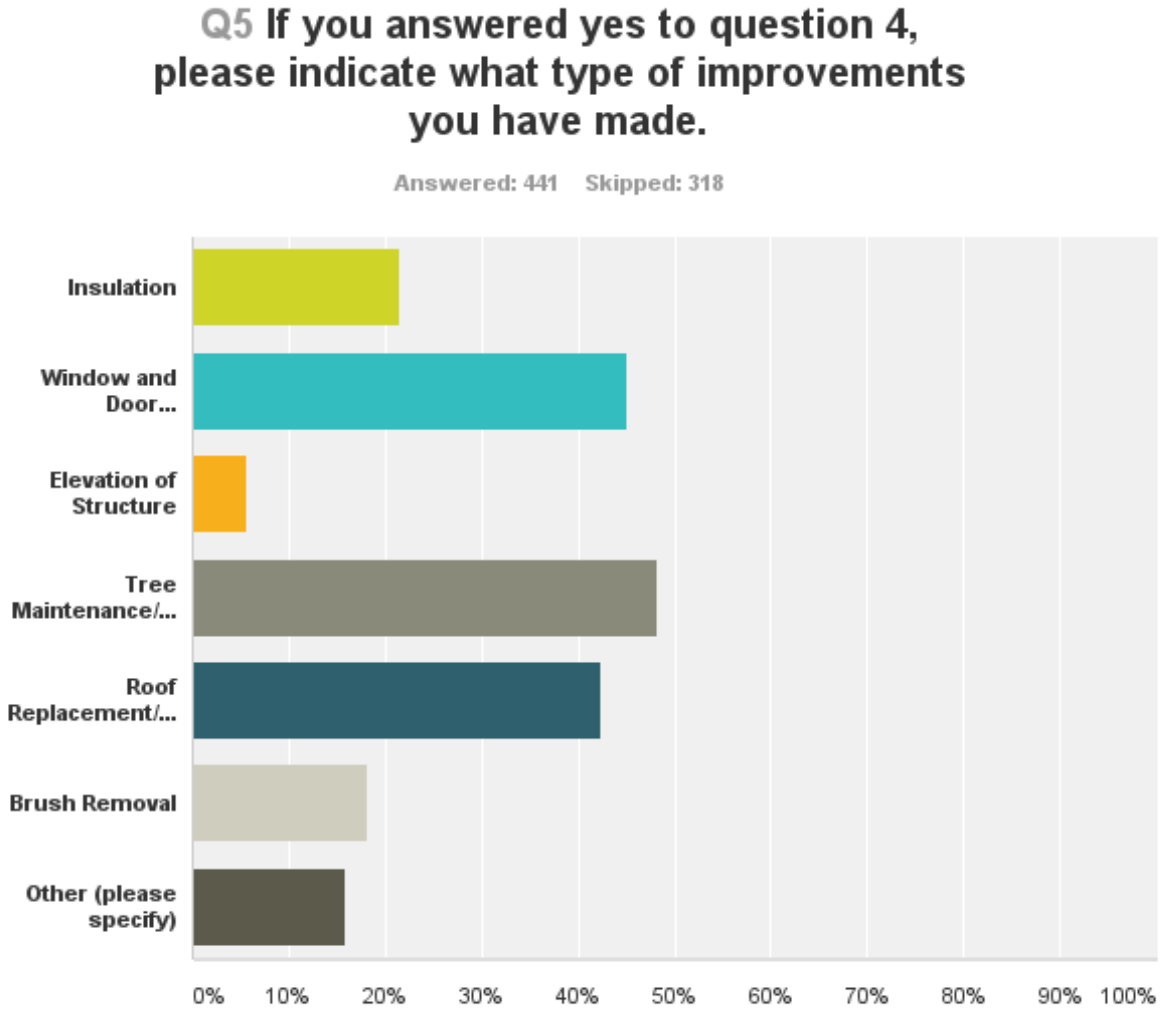
When asked to choose the hazard that was the greatest cause of concern for life and property respondents indicated the hazards that may not occur with the greatest frequency, but have the potential to cause the greatest amount of damage in a single event. The top three hazards of greatest concern were tropical storms/hurricanes, flooding and thunderstorms. These data support the vulnerability analysis presented in the HMP and the focus of mitigation actions on these hazards.

Question 4



Roughly 55% of respondents indicated that they had made improvements to their homes to reduce their vulnerability to hazards. This statistic indicates a majority among respondents who are aware of hazard risks, are sufficiently concerned and with adequate means to make investments in protections to their property. The importance of a balance of both private and public action to reduce risk cannot be overstated. Relatively small improvements such as protections to windows and doors can mean the difference between minor damage and total destruction in a high wind event. As identified in the plan, public officials can facilitate private investment by helping to identify funding opportunities or assisting homeowners to apply for individual funding for improvements.

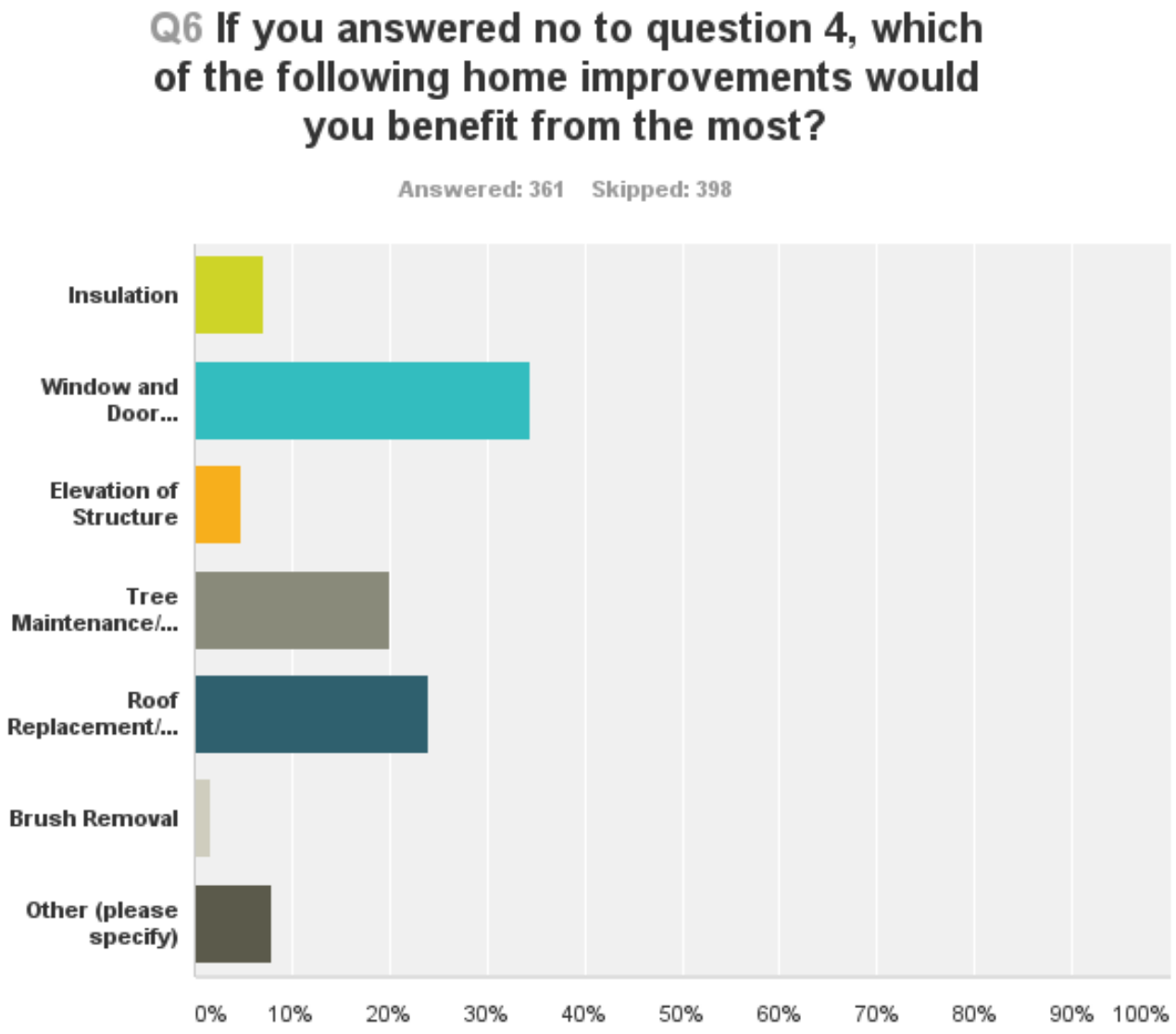
Question 5



The most common improvements made by homeowners to increase resilience to natural hazards include the maintenance and removal of trees in the vicinity of homes and the replacement/enhancement of roofs, windows and doors. In addition to reducing vulnerability to high winds and debris, enhancement/replacement of windows and doors can increase energy efficiency in heating and cooling, providing long-term cost savings for homeowners.

Tree maintenance is largely an issue for individual property owners as private lands greatly outnumber public properties. Tree ordinances generally act to preserve existing canopy in new development, but do not extend into the maintenance or removal of vulnerable trees. These vulnerable trees represent a public concern in addition to private ones in terms of debris and the damage caused to utilities/infrastructure. Public agencies can encourage homeowners to take action on this issue by offering pickup of yard waste which then can be turned into mulch or compost for use in gardening and landscaping.

Question 6



For respondents who had not yet made improvements to their properties, roofs, windows, and tree maintenance were identified as the highest priority investments. Local agencies can contribute to homeowners taking action by providing information on the benefits of these improvements, and identifying programs such as SC safe homes whereby individuals can apply for funding for home improvements.

Question 7

Q7 Please indicate your level of agreement with the following statement: My household is prepared in the event of a natural disaster.

Answered: 744 Skipped: 15

	Strongly Disagree	Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Agree	Strongly Agree	Total	Weighted Average
(no label)	5.91% 44	6.59% 49	12.77% 95	17.20% 128	30.24% 225	23.79% 177	3.49% 26	744	3.43

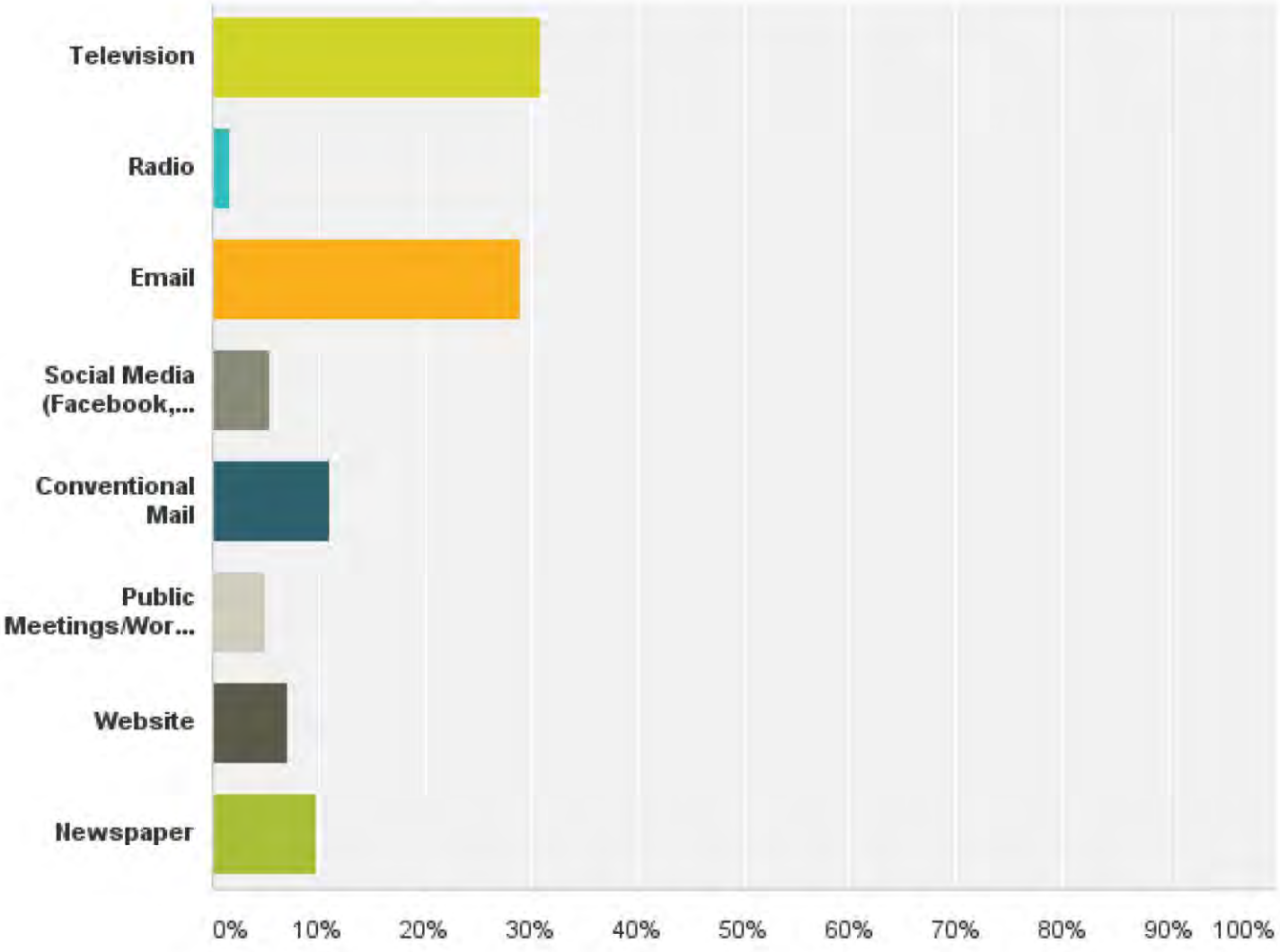
Here respondents indicated that while a majority of households are ready to some degree in the event of a disaster, that further planning is required for complete confidence in their level of preparation. These responses validate the continuing efforts of public agencies to provide information on household-level emergency planning.

Question 8

In regard to which methods respondents preferred for communication of information on hazard preparation and planning, television was cited as the favorite with email and conventional mail following in second and third place respectively. Coordination with regional media such as that conducted by Beaufort County and Hilton Head Island are key strategies informed by these responses. Respondents also indicated the dominant role of computers in the dissemination of information, and now that smartphones are commonly used to access email, the importance of this method of communication is paramount. It should be noted that as this survey was distributed largely through email and online sources, it may disproportionately capture those with a preference for this media. Diverse strategies are required to reach audiences with a variety of preferences and differing levels of access to technology. The survey responses also support the continuing distribution of brochures and other literature through conventional mail.

Q8 What is the best way for you to receive information on how to make your home and community more resistant to natural hazards?

Answered: 743 Skipped: 16



Question 9

	Not important	Somewhat important	Very Important	Total	Weighted Average
Prevention - Examples include heightened standards for hazard-resistant construction, increased regulation of construction in hazard-prone areas as well as enhanced enforcement of existing regulations.	**3.48%** 25	**33.01%** 237	**63.51%** 456	718	2.60
Property Protection - Examples include relocation, elevation, structural repairs, and storm shutters.	**2.60%** 19	**42.05%** 307	**55.34%** 404	730	2.53
Natural Resource Protection - Examples include floodplain protection, habitat preservation, wetland restoration and forest management.	**5.38%** 39	**34.48%** 250	**60.14%** 436	725	2.55
Structural Projects - Examples include dams, levees, seawalls detention / retention basins, channel modification, retaining walls and storm sewers.	**10.39%** 74	**36.52%** 260	**53.09%** 378	712	2.43
Emergency Services - Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.	**2.19%** 16	**12.02%** 88	**85.79%** 628	732	2.84
Public Education and Awareness - Examples include outreach projects, school education programs, library materials and demonstration events.	**4.14%** 30	**33.93%** 246	**61.93%** 449	725	2.58

When asked to indicate the level of importance of community-wide hazard mitigation efforts respondents overwhelmingly favored investments in emergency services and critical facilities. The second most supported strategy related to prevention strategies such as hazard resistant construction standards, enforcement of building and zoning codes, and regulation of construction in hazard-prone areas. While these two categories achieved the greatest support, all strategies were endorsed to a large degree in the survey.

Question 10

This section of the survey allowed respondents to provide additional comments on anything related to the survey, including issues that weren't addressed in the questions. Approximately 100 respondents chose to provide additional comments and the following table is a summary of the major themes that emerged. One of the issues of greatest concern was the expense and operation of storm shutters, particularly for seniors who may not have the required strength to place temporary protection measures. Another frequently raised issue was that of evacuation, not only relating to the potential for congestion, but also the confusion over designated routes, particularly for new residents.

Issue	Needs/Concerns
Trees	Need maintenance, Damage to homes/utilities.
Drainage	Need improved infrastructure, maintenance
Community Emergency Response Teams (CERT) Program	Need enhanced opportunities for community involvement
Evacuation	Congestion, New residents, Confusion
Historic Properties	Codes make improvements costly
Utilities	Undergrounding power, Stronger water and gas lines
Flood Maps	Accuracy, Potential costs for owners
Regulation	Paternalism issues, Expense
Environmentally Sensitive Areas	Need protection from development
Animals	Not allowed in shelters
Warning Systems	Improved in rural areas, more linkages between technology
Window Protection	Costly, difficult to operate/place

Future Survey Design

The significant level of participation and community input achieved through the survey process should inform the development of future hazard mitigation plans and planning processes. This process has the benefit of maximizing convenience for residents, while providing time and cost saving for planners. However, there are limitations which can be explored in future plans. For example, the distribution of the survey being largely through electronic means risks the over-representation of respondents with access to computers and preferences for electronic communication. Paper surveys were distributed in some areas, but this practice could be expanded in future plans.

In addition to distributing surveys to the County as a whole, surveys could be targeted to particularly vulnerable areas or populations, such as those identified in the SOVI analysis. Special needs populations, seniors, or Spanish-speaking residents all represent special interests that could be identified for a more in-depth exploration of their needs in emergency preparedness and recovery.

Thank you for your input!

Lowcountry residents have the opportunity to take part in planning to prevent major property damage and other losses caused by natural disasters, as the Lowcountry Council of Governments updates the Pre-Disaster Hazard Mitigation Plans for Beaufort, Colleton, Hampton and Jasper counties. The updates are on their way. Risks and hazards—including wind, wildfires, ice storms and flooding—have been identified and assessed. The next step requires structuring list of possible action steps to help mitigate any damage caused by these and other hazards. Suggestions, comments and questions from area residents will ensure that all members of the community are represented and no concerns are overlooked.

While it is important to be prepared, there is another reason for planning: in order to receive grant money for hazard mitigation projects, or to receive aid after a disaster, FEMA requires that plans be updated every five years, and that time is now.

The Plan updates are funded by FEMA, through the South Carolina Emergency Management Division (SCEMD), with the local match provided by the counties.

1. In what county is your household located?

- ◯ Beaufort
- ◯ Colleton
- ◯ Hampton
- ◯ Jasper
- ◯ Other

2. Which of the following hazards have caused life or property damage at your place of residence?

- [ ] Flood
- [ ] Tropical Storm/Hurricane
- [ ] Wildfire
- [ ] Hail
- [ ] Tornado
- [ ] Thunderstorm Wind
- [ ] Lightning
- [ ] Extreme Heat (Heat index of at least 105 °F for more than 3 hours per day for 2 consecutive days)
- [ ] Winter Storm (Snow/Ice)
- [ ] Drought
- [ ] Other (please specify)

3. Please choose the 3 hazards that are your greatest cause of concern for your life and property.

- [ ] Flood
- [ ] Tropical Storm/Hurricane
- [ ] Wildfire
- [ ] Hail
- [ ] Tornado
- [ ] Thunderstorm Wind
- [ ] Lightning
- [ ] Extreme Heat (Heat index of at least 105 °F for more than 3 hours per day for 2 consecutive days)
- [ ] Winter Storm (Snow/Ice)
- [ ] Drought
- [ ] Other (please specify)

4. Have you made any improvements to your property to protect against natural hazards?

- ( ) Yes
- ( ) No

5. If you answered yes to question 4, please indicate what type of improvements you have made.

- [ ] Insulation
- [ ] Window and Door Reinforcments/Replacements
- [ ] Elevation of Structure
- [ ] Tree Maintenance/Removal
- [ ] Roof Replacement/Repair
- [ ] Brush Removal
- [ ] Other (please specify)

6. If you answered no to question 4, which of the following home improvements would you benefit from the most?

- ( ) Insulation
- ( ) Window and Door Reinforcements/Replacements
- ( ) Elevation of Structure
- ( ) Tree Maintenance/Removal
- ( ) Roof Replacement/Repair
- ( ) Brush Removal
- ( ) Other (please specify)

7. Please indicate your level of agreement with the following statement: My household is prepared in the event of a natural disaster.

Strongly Disagree	Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Agree	Strongly Agree
( )	( )	( )	( )	( )	( )	( )

8. What is the best way for you to receive information on how to make your home and community more resistant to natural hazards?

- ◯ Television
- ◯ Radio
- ◯ Email
- ◯ Social Media (Facebook, Twitter)
- ◯ Conventional Mail
- ◯ Public Meetings/Workshops
- ◯ Website
- ◯ Newspaper

Other (please specify)

9. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.

	Not important	Somewhat important	Very Important
Prevention - Examples include heightened standards for hazard-resistant construction, increased regulation of construction in hazard-prone areas as well as enhanced enforcement of existing regulations.	◯	◯	◯
Property Protection - Examples include relocation, elevation, structural repairs, and storm shutters.	◯	◯	◯
Natural Resource Protection - Examples include floodplain protection, habitat preservation, wetland restoration and forest management.	◯	◯	◯

	Not important	Somewhat important	Very Important
Structural Projects - Examples include dams, levees, seawalls detention / retention basins, channel modification, retaining walls and storm sewers.	○	○	○
Emergency Services - Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.	○	○	○
Public Education and Awareness - Examples include outreach projects, school education programs, library materials and demonstration events.	○	○	○

10. Do you have any other comments, questions, or concerns?

RESOLUTION FOR THE TOWN OF BLUFFTON ADOPTING THE BEAUFORT COUNTY COUNCIL HAZARD MITIGATION PLAN

Whereas, the Council of the *Town of Bluffton* South Carolina recognizes that the Natural Hazard Mitigation Plan is an assessment of the risks natural hazards present to communities and how losses to human life and to property can be minimized through advance preparation. This plan is required by the Federal Emergency Management Agency (FEMA) for all counties and municipalities in the country. Projects and actions that are identified in the plan are eligible for FEMA pre-disaster mitigation funding.

Whereas, the *Town of Bluffton* has been an "official participant" in the planning process of the Natural Hazard Mitigation Plan that the Lowcountry Council of Governments prepared for Beaufort County.

Now, Therefore, be it Resolved, by the Council of the *Town of Bluffton*, South Carolina to endorse the Natural Hazard Mitigation Plan.

The resolution shall become effective this Thirteenth Day of September, 2016.

_____
Lisa Sulka, Mayor
Town of Bluffton, South Carolina

ATTEST:

_____
Sandra Lunceford, Town Clerk
Town of Bluffton, South Carolina

RESOLUTION FOR THE TOWN OF BLUFFTON ADOPTING THE BEAUFORT COUNTY COUNCIL HAZARD MITIGATION PLAN

Whereas, the Council of the *Town of Bluffton* South Carolina recognizes that the Natural Hazard Mitigation Plan is an assessment of the risks natural hazards present to communities and how losses to human life and to property can be minimized through advance preparation. This plan is required by the Federal Emergency Management Agency (FEMA) for all counties and municipalities in the country. Projects and actions that are identified in the plan are eligible for FEMA pre-disaster mitigation funding.

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The resolution shall become effective this Thirteenth Day of September, 2016.

_____
Lisa Sulka, Mayor
Town of Bluffton, South Carolina

ATTEST:

_____
Sandra Lunceford, Town Clerk
Town of Bluffton, South Carolina

Whereas, the Council of the *Town of Bluffton* South Carolina recognizes that the Natural Hazard Mitigation Plan is an assessment of the risks natural hazards present to communities and how losses to human life and to property can be minimized through advance preparation. This plan is required by the Federal Emergency Management Agency (FEMA) for all counties and municipalities in the country. Projects and actions that are identified in the plan are eligible for FEMA pre-disaster mitigation funding.

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The resolution shall become effective this _____ day of September, 2016.