SECTION 1: INTRODUCTION AND PLANNING PROCESS

1.1 INTRODUCTION

According to the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, the Natural Hazard Mitigation Plan is required by the Federal Emergency Management Agency (FEMA) for all counties in the State of South Carolina. The plan *"is the representation of the jurisdiction's commitment to reduce the risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."* Moreover, it must meet the requirements of Title 44 Code of Federal Regulations (CFR) §201.6 for FEMA approval and eligibility to apply FEMA Hazard Mitigation Assistance grant programs.

The 2020 Lowcountry Natural Hazard Mitigation Plan is an update of the 2015 Beaufort County Hazard Mitigation Plan and the 2015 Lowcountry Natural Hazard Mitigation Plan which includes Colleton, Hampton, and Jasper Counties. The result is the first fully multi-jurisdictional plan for all the counties in the Lowcountry region, including Beaufort, Colleton, Hampton, and Jasper. The plan provides a profile of the most common natural hazards in the region, including historic locations and past occurrence data, probability of future occurrence, and loss information. The plan also includes social vulnerability indicators for identifying populations at greatest risk from the effects of natural hazards. Finally, the plan identifies the mitigation actions to save lives and to prevent major property damage and other losses caused by natural disasters in the Lowcountry region. The plan was prepared by the Lowcountry Council of Governments (LCOG).

FEMA Requirements

The 2020 Lowcountry Natural Hazard Mitigation Plan addresses the FEMA requirements including:

Planning Process

- 44 CFR §201.6(c)(1): The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.
- 44 CFR §201.6(b)(2): The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.
- 44 CFR §201.6(b)(1): The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.
- 44 CFR §201.6(b)(3): The planning process shall include the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
- 44 CFR §201.6(c)(4) (iii): The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.
- 44 CFR §201.6(c)(4)(i) The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Hazard Identification and Risk Assessment

- 44 CFR §201.6(c)(2)(i): The risk assessment shall include a description of the type, location and extent of all natural hazards that can affect the jurisdiction as well as information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction
- 44 CFR §201.6(c)(2)(ii): The risk assessment shall include an overall summary of each hazard and its impact on the community as well as an overall summary of each hazard and its impact on the community. The plan must address NFIP insured structures that have been repetitively damaged by floods.
- 44 CFR §201.6 (c) (2) (iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Mitigation Strategy

- 44 CFR§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.
- 44 CFR §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
- 44 CFR §201.6(c)(3)(ii): The hazard mitigation strategy shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate. The hazard mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
- 44 CFR §201.6(c)(3)(iii): The hazard mitigation strategy shall include an action plan, describing how the actions identified will be prioritized, implemented, and administered by each local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
- 44 CFR §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
- 44 CFR §201.6(c)(4)(ii): The plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements, when appropriate.

Plan Review

- 44 CFR §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect change in development and priorities as well as progress in local mitigation efforts.

Plan Adoption

- 44 CFR §201.6(c)(5): The plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Composition of the Plan

The documentation of the planning process includes seven sections along with appendices and references.

Section 1: Introduction and Planning Process

Introduction to the 2020 Lowcountry Natural Hazard Mitigation Plan and its requirements and the planning process.

Section 2: Lowcountry Profile

Physical and socioeconomic conditions unique to the Lowcountry region including its location, geographical landscape, population, housing, and economy.

Section 3: Hazard Identification and Profile

Hazards relevant to the Lowcountry region with a description of each hazard, its location, extent, occurrences, and its future probability. It is important to understand the natural hazards that affect the Lowcountry region.

Section 4: Vulnerability Assessment

Social vulnerability indicators along with loss information in the Lowcountry region. Vulnerability is determined by assessing the probability and historical loss from each hazard. Loss information is an estimate of direct monetary losses (property and crop) and human losses (injuries and deaths) for each hazard in each county.

Section 5: Community Capability Assessment

Overview of counties and corresponding jurisdictions' efforts in incorporating the current hazard mitigation plans into other various policies, plans, and ordinances. These include, but are not limited to Comprehensive Plans, Zoning Ordinances, Land Use Plans, and Flood Mitigation Plans.

Section 6: Hazards Mitigation Strategy

Goals and strategies identified to mitigate natural hazards for the counties and municipalities participating in this plan. The goals and strategies are revised and updated from those appearing in the 2015 Beaufort County Hazard Mitigation Plan and the 2015 Lowcountry Region Natural Hazard Mitigation Plan.

Section 7: Plan Maintenance

This section details how the plan will be monitored and maintained over the next five years.

1.2 PLANNING PROCESS

To meet the requirements of Title 44 Code of Federal Regulations (CFR) §201.6, the planning process of the 2020 Lowcountry Natural Hazard Mitigation Plan follows the guidance of the *Local Mitigation Handbook* (FEMA, 2013). The Handbook's tasks were translated into the planning process workflow as illustrated in Figure 1.

Planning Area and Resources

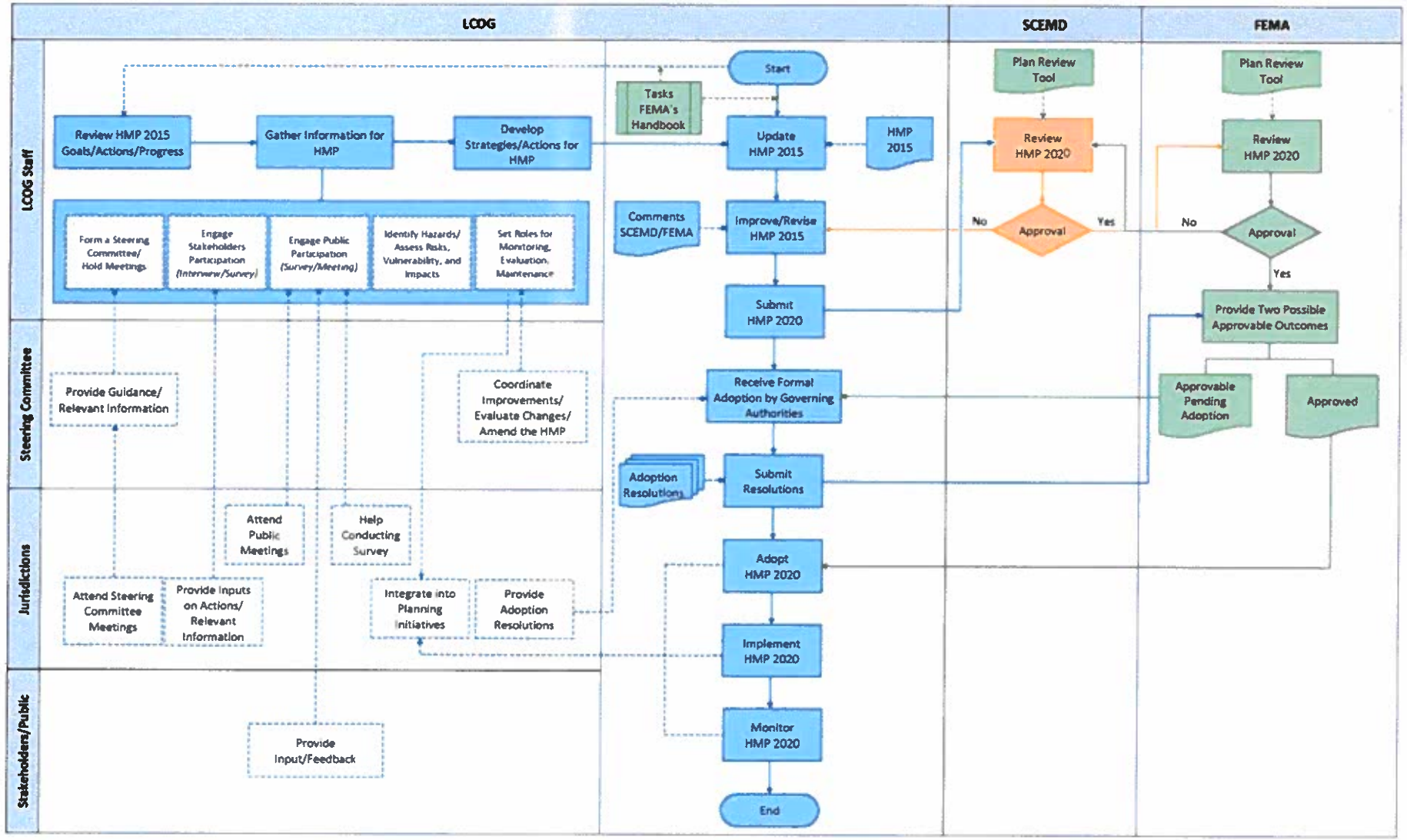
The 2020 Lowcountry Natural Hazard Mitigation Plan was coordinated by the Planning Department of the LCOG, under an individual Memorandum of Understanding (MOUs) between each county and the LCOG (See Appendix A). The planning team comprises representatives from the four counties, the Town of Hilton Head Island, the Town of Edisto beach, and the LCOG staff. The team members participated in and contributed to the plan update by serving as members of the Steering Committee and as liaisons to their respective jurisdictions, reviewing all technical information, helping in gathering information from stakeholders, and providing relevant information.

Technical assistance was provided by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI). This included the natural hazards profile and vulnerability assessment updated to the most recent available data. The HVRI is an interdisciplinary research and graduate and undergraduate training center focused on the newly emergent field of hazard vulnerability science. In addition to basic research, HVRI facilitates local, state, and federal government efforts to improve emergency preparedness, planning, and response and disaster resilience through its outreach activities including providing technical assistance.

The socioeconomic information unique to the Lowcountry region including population, housing, and economy were obtained from the U.S. Census Bureau and South Carolina Department of Employment and Workforces. Other resources used throughout the planning process included, but were not limited to, Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Administration (NOAA), National Lightning Detection Network (NLDN), South Carolina Emergency Management Division (SCEMD), South Carolina Department of Natural Resources (SCDNR), Southeast Regional Climate Center (SERCC), and United States Geological Survey (USGS).

Lastly, the information from the residents of the Lowcountry region were integral to the planning process. The planning effort involved opportunities for public comment through a community survey and a public participation process.

Figure 1: 2020 Lowcountry Natural Hazard Mitigation Plan Workflow



Planning Team Organization

The 2020 Lowcountry Natural Hazard Mitigation Plan is an update of the 2015 Beaufort County Hazard Mitigation Plan and the 2015 Lowcountry Natural Hazard Mitigation Plan which expires June 3, 2021 and March 31, 2021, respectively (LCOG 2015a & LCOG 2015b). Building on the foundation of the 2015 Plans, in October 2018 the LCOG began working with the participating jurisdictions on grant submission for the "Hazard Mitigation Plan Update for Beaufort, Colleton, Hampton, and Jasper Counties." The grant was submitted to FEMA in December 2018 and awarded in October 2019.

Hazard Mitigation Plan Steering Committee

In 2020, the Steering Committee was formed to help in the creation and development of the Plan. The steering committee members were chosen based on their expertise in natural hazard preparation and planning within their respective jurisdictions. These included the heads of the county emergency service offices, the jurisdictional representatives, and the LCOG staff. The steering committee includes:

- Beaufort County
  Pamela Cobb, Disaster Recovery Coordinator
  100 Ribaut Road, Beaufort, SC 29902
  843-255-2721, pcobb@beaufortgov.net
- Town of Hilton Head Island
  Shari Mendrick, Floodplain Administrator
  1 Town Center Court, Hilton Head Island, SC 29928
  843-341-4687, sharim@hiltonheadislandsc.gov
- Colleton County
  David Greene, Deputy Chief/Emergency Manager, Fire Rescue
  113 Mable T. Willis Boulevard, Walterboro, SC 29488
  843-539-1960, dgreene@colletoncounty.org
- Town of Edisto Beach
  Iris Hill, Town Administrator
  2414 Murray Street, Edisto Beach, SC 29438
  843-869-2505 extension 211, ihill@townofedistobeach.com
- Hampton County
  Susanne Peeples, Director, Emergency Management
  703 2nd Street West, Hampton, SC 29924
  803-914-2150, speeples@hamptoncountysc.org
- Jasper County
  Russell Wells, Interim Director, Emergency Services
  1509 Grays Hwy, Ridgeland, SC 29936
  843-726-7607, rwells@jaspercountysc.gov
- Lowcountry Council of Governments
  Stephanie Rossi, Director, Planning Department
  PO Box 98|634 Campground Road, Yemassee, SC 29945
  843-473-3958, srossi@lowcountrycog.org
  Maleena Parkey, Senior Planner (Project Manager), Planning Department
  843-473-3987, maprkey@lowcountrycog.org

The roles of the Steering Committee members throughout the planning process included:

- Acting as liaisons for the plan update between their jurisdictions and LCOG staff.
- Providing guidance on how to approach the plan update.
- Providing information regarding hazard preparedness and other activities related to hazard mitigation in their respective jurisdictions.
- Assisting in public information and communication through their respective organizations.
- Assisting in development of internal policies and procedures to implement relevant recommendations.
- Assisting in implementation of recommendations of the Plan including, but not limited to, the applications for funding for the Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) grants.

In March 2020, the LCOG informed the steering committee, of the planning process and timeframe of the plan update. Two steering committee meetings followed. All meeting minutes are included in Appendix B-1. One-on-one meetings were also scheduled with each steering committee member to discuss any issues as needed.

First Steering Committee Meeting

The first steering committee meeting was held on August 27, 2020. The purposes were to ensure that all members understand their roles and the plan's purpose, to inform the work progress, and to discuss action updates, and the tasks needed in the plan update.

Second Steering Committee Meeting

The second steering committee meeting was held on December 7, 2020. This meeting emphasized updating and refining the goals and strategies and finalizing the plan.

One-On-One Meeting

One-on-one meetings were held between steering committee members and LCOG staff. The purpose of these meetings was to gain further perspectives and information regarding the mitigation actions and strategies, critical facilities, and other relevant information. Summaries of the meetings are shown in the Appendix B-2.

Stakeholders and Public Participation

Building on the 2015 Plans and the current situation with the COVID-19 pandemic, in-person outreach to distribute and gather information regarding the natural hazard mitigation was very limited. LCOG developed an approach that would take advantage of the now widespread use of social media, computers, smartphones, and other devices to obtain meaningful input from stakeholders and public. Traditional press releases were also distributed along with legal notices in the most heavily distributed regional newspapers.

Jurisdictional Participation

The LCOG adopted the previous plan's criteria for counties and municipalities to officially participate in the planning process. These criteria included:

- Beaufort, Colleton, Hampton, and Jasper Counties and LCOG establishing a partnership under the Memorandum of Understanding.
- The jurisdiction's mayor, administrator, or manager providing input or comments on the Natural Hazard Mitigation Plan.
- The jurisdiction's EMS Director or appointed representative serving as a member of the Steering Committee and providing input and comments on the Natural Hazard Mitigation Plan and the planning process.
- The jurisdiction's representative providing input and comments on the Natural Hazard Mitigation Plan and the planning process.
- The LCOG Planning staff personally discussing the Natural Hazard Mitigation Plan with a jurisdiction's mayor, administrator, manager, or appointed representative, and providing with input or comments.

Table 1 shows how each jurisdiction participated in the planning process.

Emergency Manager Survey

The LCOG developed the emergency manager survey for participating jurisdictions as shown in Appendix C-1. The survey was distributed via email to the steering committee members to help gather information and reach out to emergency managers in their respective jurisdictions. The LCOG also worked with steering committee members individually to update actions, critical facilities, and other relevant information needed. This information assisted in the analysis of completed actions and documentation of the need for future actions.

Table 1: Jurisdictional Participation

Participating Jurisdictions			Steering Committee	Stakeholders/ Public Participation	Document Review	Additional Information
Beaufort County	Eric Greenway	Interim County Administrator		✓	✓	
	Ashley Jacobs	County Administrator (former)		✓		
	Pamela Cobb	Disaster Recovery Coordinator	✓	✓	✓	
	Charles Atkinson	Building Codes Director		✓		
City of Beaufort	William Prokop	City Manager		✓	✓	
	Reece Bertholf	Assistant City Manager/Fire Chief		✓		
	David Prichard	Community and Economic Development Director		✓		
	Matthew Street Clair	Public Projects and Facilities Director		✓		
	George Erdel	E.M. Coordinator and Public Information Officer, Police Department		✓		
	Martie McTeer	Development review Coordinator				✓
Town of Bluffton	Marc Orlando	Town Manager (former)		✓	✓	
	Stephanie Price	Chief of Police		✓	✓	
	Donald Chandler	Captain – Support Division Commander, Police Department		✓		
	Morganne Whatley	Customer Service Supervisor				✓
Town of Hilton Head Island	Shari Mendrick	Floodplain Administrator	✓	✓	✓	
	Nancy Stephens	Application/Records Manager				✓
Town of Port Royal	Van Willis	Town Manager		✓	✓	
	Linda Bridges	Planning Administrator		✓		
Colleton County	Kevin Griffin	County Administrator		✓	✓	
	David Greene	Deputy Chief, Fire Rescue	✓	✓	✓	

Participating Jurisdictions			Steering Committee	Stakeholders/ Public Participation	Document Review	Additional Information
	Janet Laney	Captain, Fire Rescue		✓		
	Adrienne Stokes	Staff, Fire Rescue		✓		
	Zach Montgomery	Planning and Development Director				✓
Town of Edisto Beach	Iris Hill	Town Administrator	✓	✓	✓	
	Margaret Green	Building Permit Technician				✓
City of Walterboro	Bonnie Ross	Planning Technician				✓
Hampton County	Rose Dobson-Elliot	County Administrator		✓	✓	
	Susanne Peeples	Emergency Management Director	✓	✓	✓	✓
	Renee Bennett	Office Manager				✓
Town of Hampton	Keith Browning	Building Official				✓
Town of Yemassee	Matthew Garnes	Town Clerk				✓
Jasper County	Andrew Fulghum	County Administrator		✓	✓	
	Russell Wells	Interim Director, Emergency Services	✓	✓	✓	
City of Hardeeville	Ashley Moody	Permit Technician				✓
Town of Ridgeland	Joshua Rowland	Planning and Community Development Director				✓

Stakeholders Involvement

Stakeholders' involvement is essential in the planning process. In addition to participating jurisdictions, stakeholders from local and regional agencies involved in hazard mitigation activities. The following are a list of local and regional organizations, neighboring communities, and jurisdictions' governing body given an opportunity to provide feedback for the Plan Update.

- Lowcountry Area Agency on Aging
- Lower Savannah Council of Governments
- Berkeley-Charleston-Dorchester Council of Governments
- Governing Body:
  - Beaufort County
  - City of Beaufort
  - Town of Bluffton
  - Town of Hilton Head Island
  - Town of Port Royal
  - Colleton County
  - Town of Cottageville
  - Town of Edisto Beach
  - City of Walterboro
  - Hampton County
  - Town of Estill
  - Town of Hampton
  - Town of Varnville
  - Town of Yemassee
  - Jasper County
  - City of Hardeeville
  - Town of Ridgeland

Also, LCOG meets or works with local and regional agencies to discuss issues, when appropriate, relevant to disasters and/or emergencies. These include:

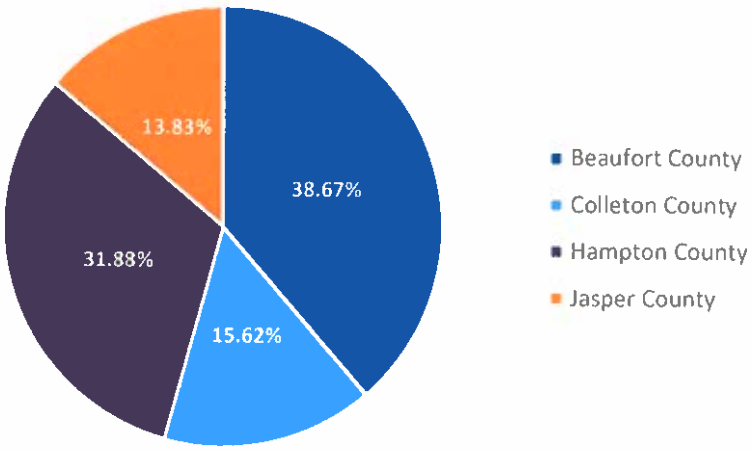
- Weekly meeting with Colleton County EMD through the regional call that connects to the statewide EMD call with SCDHEC.
- Quarterly meeting with Technical Committee for Military Installation Resilience, Beaufort Conservation District, Lowcountry Stormwater Partners, SC Sea Grant Consortium, US Army Corps of Engineers.
- Ad hoc meeting with local agencies related to senior services to ensure that they are prepared in the event of a disaster or emergency. These agencies include:
  - Beaufort County Council on Aging
  - Colleton County Council on Aging
  - Hampton County Council on Aging
  - Jasper County Council on Aging
  - Right at Home Homecare
  - Lowcountry Family Services, Inc.
  - Priority Homecare
  - ACCESS Homecare
  - Home Sweet Home Homecare
  - Smiley's Homecare

Community Survey

The LCOG developed the community survey in both English and Spanish to gather information on the Lowcountry residents' experiences and perceptions of natural hazards, planning and preparation for natural hazards, and support of community hazard mitigation activities. The survey was distributed through Survey Monkey as shown in Appendix C-2. Since not everyone has access to the internet, paper copies were distributed. LCOG issued a press release with a link to the survey and distributed the survey via its website, newsletter, and social media accounts. Also, counties and municipalities assisted in distributing the survey link via their webpages, emails, social media, as well as distributing paper copies. Examples of survey distribution can be seen in Appendix C-3.

The community survey was open continuously for more than three months. Overall, there were 864 responses of which 781 came from residents of the four counties. The other 83 responses came from Charleston, Chatham (GA), Orangeburg, and Richland Counties, or there was no location disclosed. Of the total responses, 38.67% were from Beaufort County, 15.62% were from Colleton County, 31.88% were from Hampton County, and 13.83% were from Jasper County, as shown in Figure 2.

Figure 2: Community Survey Responses



The survey results identified twelve hazards that cause damage to property and loss of life for Lowcountry residents. These are:

- Tornado
- Hurricane
- Windstorm
- Lightning
- Hail
- Drought
- Earthquake
- Wildfire
- Flood
- Winter Storm
- Coastal Erosion
- Extreme Heat

The most frequently cited hazards to cause damage to property are hurricanes, windstorms, and lightning, while the hazards of greatest concern for their life and property are hurricanes, tornadoes, and lightning. This data is supported by the hazards profile and vulnerability assessment in Section 3 and 4. All survey results can be seen in the Appendix C-4.

The community survey was distributed to both the public and specific groups, including senior populations and businesses as shown in Appendix C-5.

Hazard Identification and Profile

The hazard identification and risk assessment compiled for the Lowcountry region covers twelve different hazards that are of most concern in the region. These hazards include tornado, hurricane wind/storm surge, windstorm, lightning, hail, drought, earthquake, wildfire, flood (including King tides and sea level rise), winter storm, coastal erosion, and extreme heat. The profiles include historic location and occurrence data along with loss information and social vulnerability indicators.

Given the prior approved plans from 2015 the current profiles provide only updated (2012-present) data and information on location and occurrences, notable events, future probabilities, loss and damage information, and social vulnerability.

Mitigation Strategy

The goals and strategies towards the hazard mitigation for the Lowcountry region from the 2015 plans were revised to respond the region's current conditions. This included assessing the updated socioeconomic conditions, community survey results, emergency manager survey results, hazard identification and profiles, and the implementation status of the 2015 mitigation actions. The revised goals and strategies are the guide for formulating the 2020 hazard mitigation actions.

Plan Review

All participating jurisdictions were contacted and notified of the planning process and the progress of the plan. The progress report and the draft final plan were distributed to the steering committee and stakeholders for review and comments. Also, the draft final plan was made available to the public for review. The results are the following.

- Progress Reports
  - Hazard identification and vulnerability assessment: The report was distributed to the steering committee members for review on August 25, 2020. Review comments were received from the steering Committee member from the Town of Edisto Beach on August 27, 2020.
  - Community survey, emergency survey, demographic data collection and mapping: A status update was distributed to the steering committee members on September 15, 2020. No comments were received.
  - Lastly, the report included completed, nearly completed, and remaining tasks to understand the timeframe for the completion of the 2020 Plan. This update was distributed to the steering committee members on November 17, 2020. No comments were received.

- Draft Final Plan – The draft final plan was completed and made available to the public for review between December 11, 2020 to January 8, 2021, and to stakeholders and steering committee members for review between December 22, 2020 to January 8, 2021. The plan was made available via LCOG's website and social media accounts. Counties and municipalities assisted in distributing the plan via their webpages, emails, social media. Advertisements have been run in local newspapers, as well. Examples of distributions can be seen in Appendix D. Comments were received during the comment period, with closing date on January 8, 2021. The plan revision was made accordingly.

- Final Plan
  - The final plan was submitted to the State Hazard Mitigation Officers (SHMO) for review and comments on January 15, 2021. LCOG received the completed Plan Review Tool on February 18, 2021 and made revisions accordingly.
  - The revised final plan was submitted to the SHMO on March 1, 2021 and was forwarded to FEMA on March 4, 2021. LCOG received a request for revisions back from FEMA on April 7, 2021 and made revisions as directed.
  - The revised final plan was resubmitted to the SHMO on April 21, 2021.

Plan Adoption

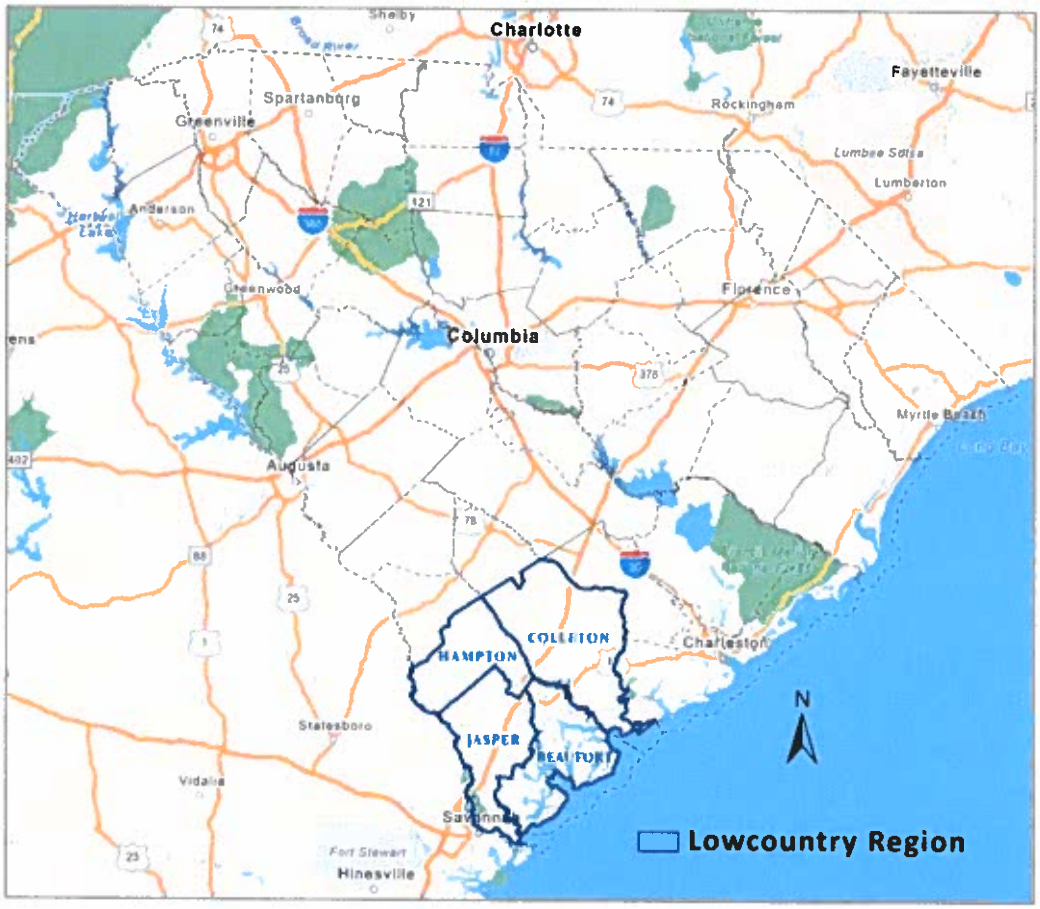
Required by FEMA, "Each jurisdiction that is included in the plan must have its governing body adopt the plan prior to FEMA approval." The LCOG has requested all participating jurisdictions to formally adopt the 2020 Lowcountry Natural Hazard Mitigation Plan through approval of a resolution on April 14, 2021.

SECTION 2: LOWCOUNTRY PROFILE

2.1 LOWCOUNTRY AREA

With land area of 2,848 square miles, the Lowcountry region comprises Beaufort, Colleton, Hampton, and Jasper Counties, twenty-one municipalities, and unincorporated areas such as, Daufuskie Island, Islandton, Early Branch, and Coosawhatchie. The Lowcountry Region is bisected by Interstate-95 and US 278 runs diagonally from the northwest to the southeast. The interstate is not only a major cross-country corridor, but also a critical conduit for the local economy and a gateway to the region's top tourist destinations. The region's economy is also driven, by the Port of Charleston the Port of Savannah in Georgia and multiple military installations in the Beaufort and Savannah areas. US 17 connects the Lowcountry to downtown Savannah and the future Jasper Ocean Terminal to the south and to Charleston in the north. The region is served by CSX rail and Amtrak, with a passenger depot in the Town of Yemassee. There is a general aviation airport in each county, in addition to the nearby Charleston and Savannah-Hilton Head International Airports. All major transportation modes would be impacted by a significant hazard situation. The following maps shows areas that are included in this plan.

Figure 3: Lowcountry Location



Beaufort County

Beaufort County, approximately 576 square miles in land area, is situated along the southern portion of South Carolina's Atlantic coastal plain. It is bordered by Colleton County on the northeast, Hampton County on the northwest, Jasper County on the southwest, and the Atlantic Ocean on the south. Most areas are comprised largely of tidal marshes and swamps. Beaufort County's climate is generally subtropical with hot summers and mild winters. It is wet and partly cloudy year-round. The average annual rainfall is approximately 49 inches with 105 days per year. Over the course of the year, the temperature typically varies from 42°F to 90°F and is rarely below 29°F or above 96°F (FEMA, 2020 & Weatherspark.com).

There are four municipalities within Beaufort County, the City of Beaufort and the Towns of Bluffton, Hilton Head Island, and Port Royal.

Colleton County

Colleton County, approximately 1,056 square miles in land area, is situated in the southwestern region of South Carolina, on the Atlantic Ocean. It is bordered by Bamberg and Orangeburg Counties to the north, Allendale and Hampton Counties to the west, the Atlantic Ocean and Beaufort County to the south, Charleston County to the east, and Dorchester County to the northeast. The county is situated on a low coastal plain, with a significant portion of its area consisting of tidal marshes and swamps. Most of the land situated in the floodplains is undeveloped marshland with some residential, commercial, and industrial development. Colleton County's climate is humid and subtropical. The summers are hot and oppressive while the winters are short and cold. It is wet and partly cloudy year-round. The average annual rainfall is approximately 47 inches with 96 days per year. Over the course of the year, the temperature typically varies from 38°F to 91°F and is rarely below 26°F or above 97°F (FEMA, 2020 & Weatherspark.com).

There are six municipalities within Colleton County including the City of Walterboro and the Towns of Cottageville, Edisto Beach, Lodge, Smoaks, and Williams.

Hampton County

Hampton County, approximately 559 square miles in land area, is situated in the southeastern part of South Carolina. It is bordered on the northwest by Allendale County, to the west by Screven County, GA, to the southwest by Effingham County, GA, the north by Bamberg County, to the south by Jasper County, to the southeast by Beaufort County, and to the east by Colleton County, SC. Hampton County's climate is humid and subtropical. The summers are hot and oppressive, and the winters are short and cold. It is wet and partly cloudy year-round. The average annual rainfall is approximately 48 inches with 106 days per year. Over the course of the year, the temperature typically varies from 38°F to 92°F and is rarely below 25°F or above 98°F (FEMA, 2020 & Weatherspark.com).

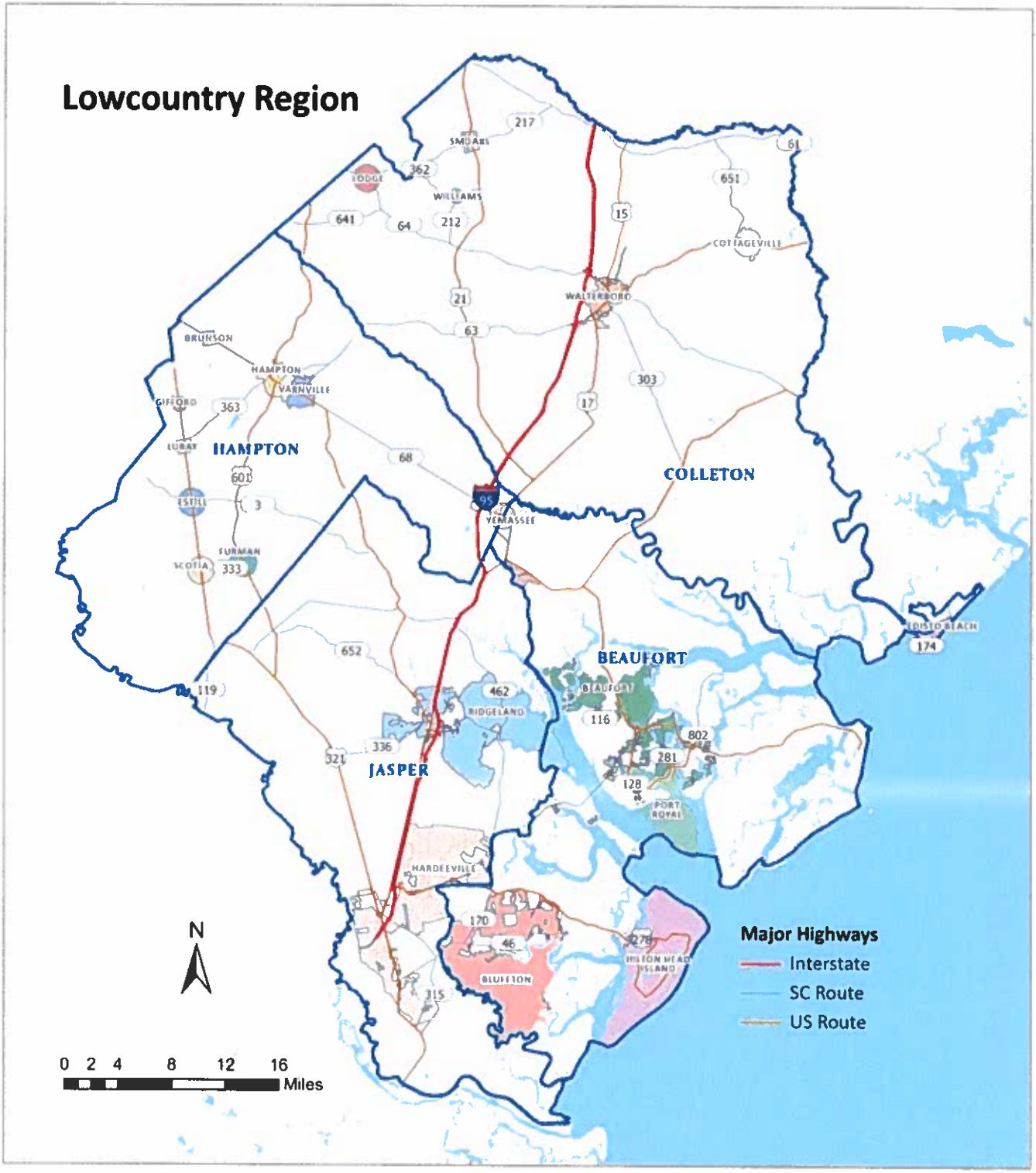
There are nine municipalities within Hampton County including the Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee.

Jasper County

Jasper County, approximately 655 square miles in land area, is situated in the southeastern portion of South Carolina in the Atlantic coastal plain. The county is bordered by Beaufort County on the northeast, Chatham County, GA on the southwest, Effingham County, GA on the west across the Savannah River, Hampton County on the north, and the Atlantic Ocean on the south. Jasper County's climate is humid and subtropical. The summers are long and hot, and the winters are short and cold. It is wet and partly cloudy year-round. The average annual rainfall is approximately 48 inches with 105 days per year. Over the course of the year, the temperature typically varies from 40°F to 92°F and is rarely below 26°F or above 98°F (FEMA, 2020 & Weatherspark.com).

There are two municipalities within Jasper County, the City of Hardeeville and the Town of Ridgeland.

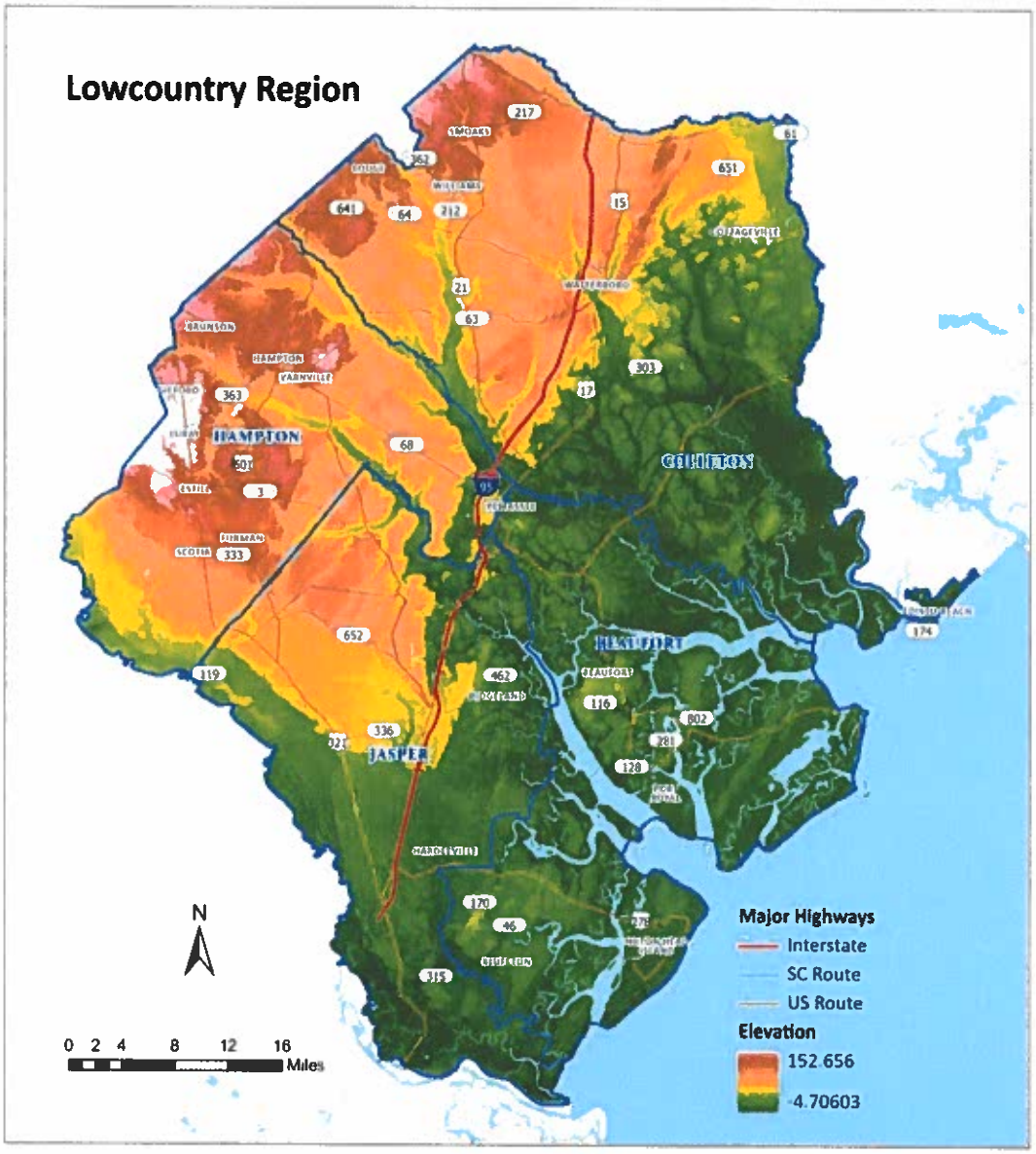
Figure 4: County and Municipality Location



Source: South Carolina Department of Natural Resource (SCDNR)

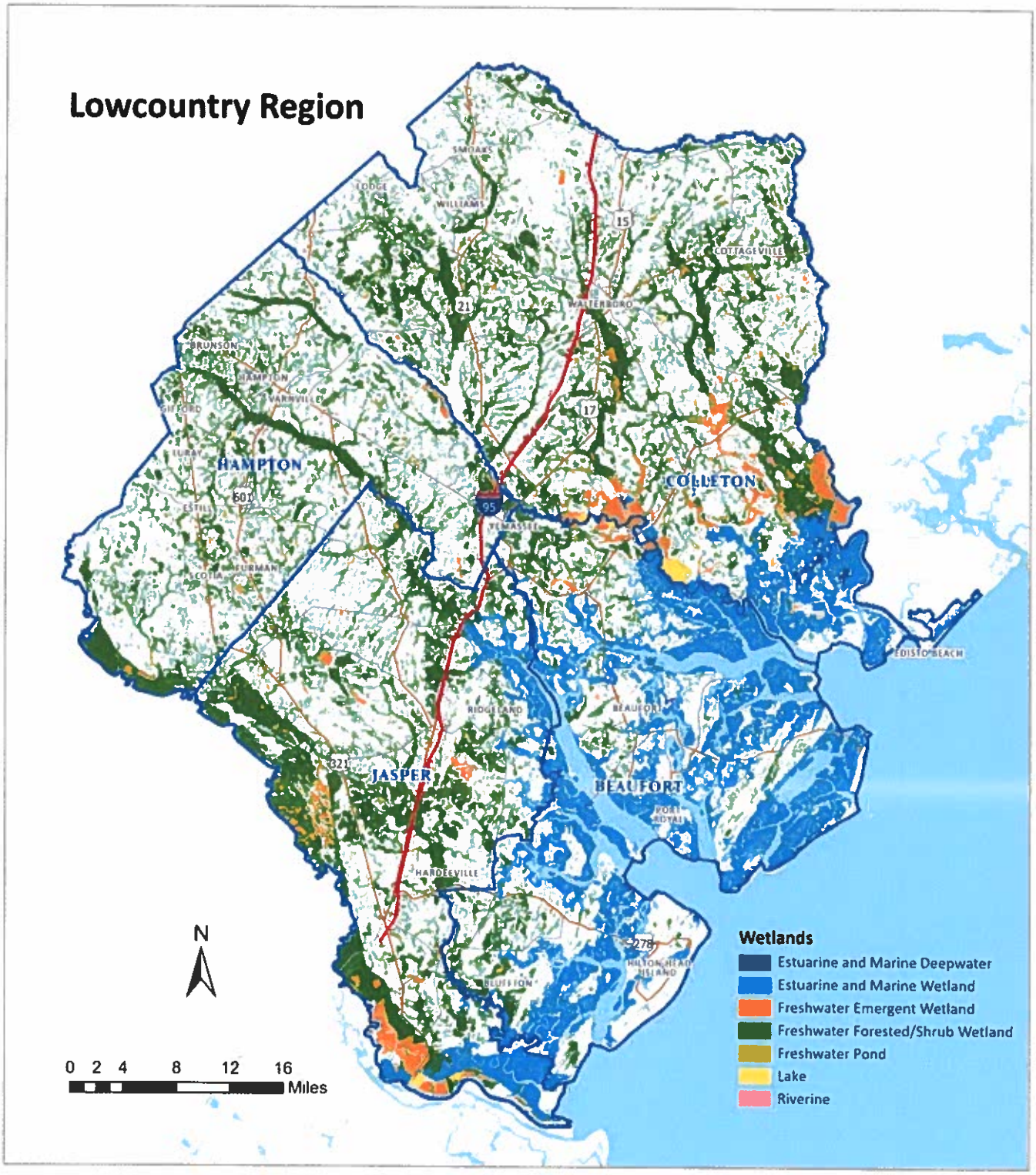
The Lowcountry is characterized by its proximity to the ocean, saltwater marshes, forested wetlands, and large tracts of pine forests. Lowcountry forested areas support diverse wildlife communities, clean water, renewable material, and recreation. They can also provide fuel for wildfires if they are not managed. The Lowcountry elevation slopes up gently inland with tidal creeks reaching into the three major watersheds of the Savannah, Salkehatchie, and Edisto Rivers. The marshes and wetlands offer unique and attractive amenities for residential development; however, they can also make construction problematic because of environmental constraints. The area's abundant saltwater marshes are filled with sea grass which weaken and/or dissipate waves and retain sediment during storms, a value hard to put a price on. The landscape is a desirable place to call home particularly where a waterfront, marsh view, or other distinctive waterbody exist, however, this landscape can also make housing and other buildings vulnerable to flooding and wind damage.

Figure 5: Elevation



Source: South Carolina Department of Natural Resource (SCDNR) and U.S. Geological Survey (USGS)

Figure 6: Wetlands



Source: South Carolina Department of Natural Resource (SCDNR)

2.2 LOWCOUNTRY POPULATION

Population and Density

Between 2000 and 2010, the four county Lowcountry region was one of the fastest growing regions in the state, with Beaufort County being the fastest growing among the larger counties and Jasper County in the top ranks of the smaller counties. Table 2 shows that between 2010 and 2018, population growth in the Lowcountry slowed when compared with the period 2000 through 2010. The population growth reversed in Colleton and Hampton Counties between 2010 and 2018.

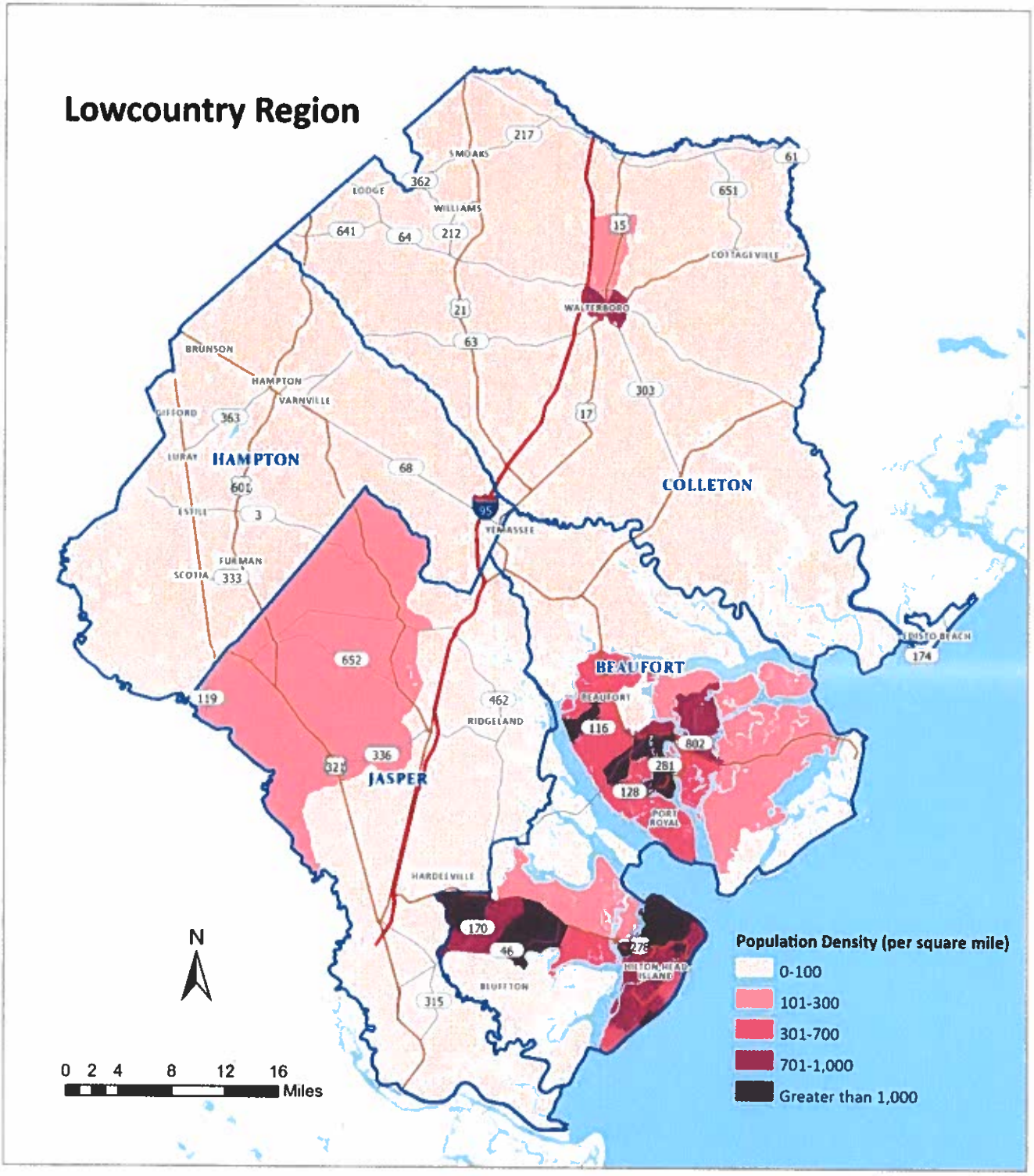
Table 2: Population Growth 2000-2018

Jurisdictions	2000	2010	2015	2018	Percent Change 2000-2010	Percent Change 2010-2018	Percent Change 2015-2018
Beaufort County	**120,937**	**162,233**	**171420**	**188,715**	**34.1%**	**16.3%**	**10.1%**
City of Beaufort	12,950	12,361	12,839	13,357	-4.5%	8.1%	4.0%
Town of Bluffton	1,275	12,978	14,607	23,097	917.9%	78.0%	58.1%
Town of Hilton Head Island	33,862	37,099	39,071	39,639	9.6%	6.8%	1.5%
Town of Port Royal	3,950	10,678	11,513	13,037	170.3%	22.1%	13.2%
Colleton County	**38,264**	**38,892**	**38,004**	**37,660**	**1.6%**	**-3.2%**	**-0.9%**
Town of Cottageville	707	766	853	744	8.3%	-2.9%	-12.8%
Town of Edisto Beach	641	414	600	407	-35.4%	-1.7%	-32.2%
Town of Lodge	114	120	96	113	5.3%	-5.8%	17.7%
Town of Smoaks	140	126	143	119	-10.0%	-5.6%	-16.8%
City of Walterboro	5,153	5,398	5,312	5,468	4.8%	1.3%	2.9%
Town of Williams	116	117	131	112	0.9%	-4.3%	-14.5%
Hampton County	**21,386**	**21,090**	**20,473**	**19,351**	**-1.4%**	**-8.2%**	**-5.5%**
Town of Brunson	589	554	547	502	-5.9%	-9.4%	-8.2%
Town of Estill	2,425	2,040	2,244	1,874	-15.9%	-8.1%	-16.5%
Town of Furman	286	239	264	217	-16.4%	-9.2%	-17.8%
Town of Gifford	370	288	363	264	-22.2%	-8.3%	-27.3%
Town of Hampton	2,837	2,808	2,726	2,531	-1.0%	-9.9%	-7.2%
Town of Luray	115	127	176	116	10.4%	-8.7%	-34.1%
Town of Scotia	227	215	163	201	-5.3%	-6.5%	23.3%
Town of Varnville	2,074	2,162	2,277	1,991	4.2%	-7.9%	-12.6%
Town of Yemassee	807	1,027	893	962	27.3%	-6.3%	7.7%
Jasper County	**20,678**	**24,777**	**26,549**	**28,971**	**19.8%**	**16.9%**	**9.1%**
City of Hardeeville	1,793	2,952	4,353	6,515	64.6%	120.7%	49.7%
Town of Ridgeland	2,518	4,036	4,030	3,831	60.3%	-5.1%	-4.9%

Source: U.S. Census Bureau, Population Estimates, Annual Estimates of the Resident Population

With a total population of 274,697, the average population density in the Lowcountry area is 96 people per square mile (see Figure 7). The densest areas are in portions of the City of Beaufort and the Towns of Bluffton, Hilton Head Island and Port Royal.

Figure 7: Population Density by Census Tract 2018



Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Annual Estimates of the Resident Population 2018

Aging Population

As shown in Table 3, the number of people older than 65 has markedly increased in all four counties since 2010. The increase in older population is in line with much of the rest of the United States and has implications for the regional economy and community services.

Table 3: Age Cohorts 2000-2018

Beaufort County					
Ages	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Total Population	120,937	162,233	188,715	34.15%	16.32%
Under 5 years	8,110	10,960	9,662	35.14%	-11.84%
5 to 9 years	8,033	9,566	9,658	19.08%	0.96%
10 to 14 years	7,747	8,553	10,015	10.40%	17.09%
15 to 19 years	8,722	9,956	10,776	14.15%	8.24%
20 to 24 years	10,002	11,756	11,967	17.54%	1.79%
25 to 34 years	16,434	20,137	20,814	22.53%	3.36%
35 to 44 years	16,433	17,534	18,844	6.70%	7.47%
45 to 54 years	14,019	18,580	19,735	32.53%	6.22%
55 to 59 years	6,397	9,886	12,050	54.54%	21.89%
60 to 64 years	6,286	12,273	13,752	95.24%	12.05%
65 to 74 years	11,329	20,137	30,623	77.75%	52.07%
75 to 84 years	5,913	9,698	15,975	64.01%	64.72%
85 years +	1,512	3,197	4,844	111.44%	51.52%

Colleton County					
Ages	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Total Population	38,264	38,892	37,660	1.64%	-3.17%
Under 5 years	2,649	2,579	2,252	-2.64%	-12.68%
5 to 9 years	2,957	2,515	2,289	-14.95%	-8.99%
10 to 14 years	3,053	2,706	2,436	-11.37%	-9.98%
15 to 19 years	2,889	2,682	2,226	-7.17%	-17.00%
20 to 24 years	2,045	2,229	2,109	9.00%	-5.38%
25 to 34 years	4,682	4,157	4,455	-11.21%	7.17%
35 to 44 years	5,617	4,709	4,020	-16.17%	-14.63%
45 to 54 years	5,478	5,763	4,782	5.20%	-17.02%
55 to 59 years	2,183	2,869	2,761	31.42%	-3.76%
60 to 64 years	1,783	2,605	2,735	46.10%	4.99%
65 to 74 years	2,794	3,635	4,667	30.10%	28.39%
75 to 84 years	1,641	1,741	2,208	6.09%	26.82%
85 years +	493	702	720	42.39%	2.56%

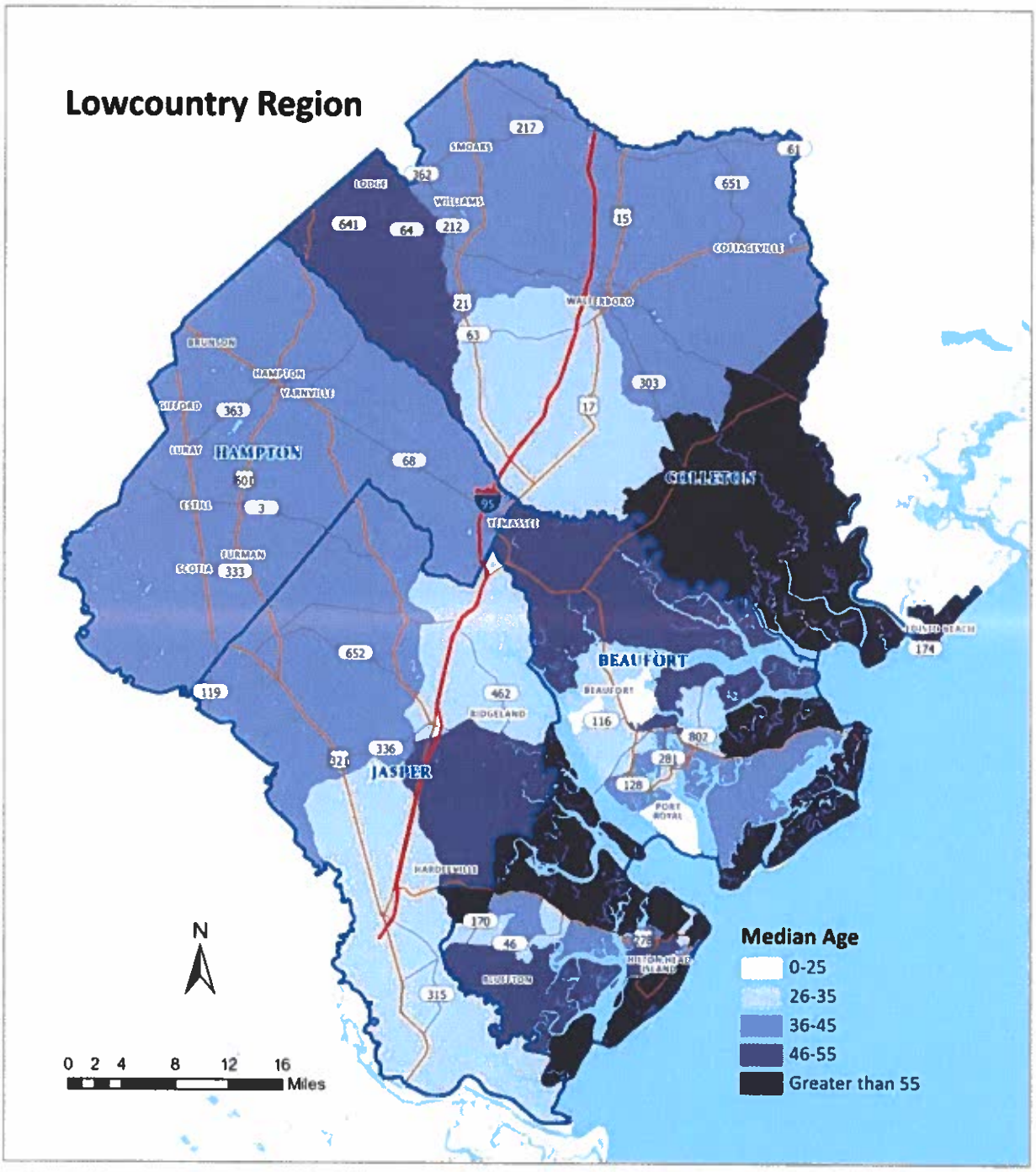
Hampton County					
Ages	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Total Population	21,386	21,090	19,351	-1.38%	-8.25%
Under 5 years	1,431	1,347	1,029	-5.87%	-23.61%
5 to 9 years	1,659	1,326	1,119	-20.07%	-15.61%
10 to 14 years	1,774	1,473	1,224	-16.97%	-16.90%
15 to 19 years	1,599	1,524	1,157	-4.69%	-24.08%
20 to 24 years	1,256	1,229	1,140	-2.15%	-7.24%
25 to 34 years	3,052	2,648	2,540	-13.24%	-4.08%
35 to 44 years	3,290	2,915	2,464	-11.40%	-15.47%
45 to 54 years	2,923	3,103	2,471	6.16%	-20.37%
55 to 59 years	1,010	1,420	1,319	40.59%	-7.11%
60 to 64 years	797	1,276	1,325	60.10%	3.84%
65 to 74 years	1,447	1,655	2,123	14.37%	28.28%
75 to 84 years	874	869	1,066	-0.57%	22.67%
85 years +	274	305	374	11.31%	22.62%

Jasper County					
Ages	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Total Population	20,678	24,777	28,971	19.82%	16.93%
Under 5 years	1,499	1,859	1,659	24.02%	-10.76%
5 to 9 years	1,602	1,711	1,622	6.80%	-5.20%
10 to 14 years	1,559	1,546	1,668	-0.83%	7.89%
15 to 19 years	1,483	1,751	1,503	18.07%	-14.16%
20 to 24 years	1,527	1,969	1,911	28.95%	-2.95%
25 to 34 years	3,063	3,685	3,904	20.31%	5.94%
35 to 44 years	3,282	3,217	3,198	-1.98%	-0.59%
45 to 54 years	2,538	3,524	3,593	38.85%	1.96%
55 to 59 years	1,041	1,428	2,181	37.18%	52.73%
60 to 64 years	815	1,300	2,122	59.51%	63.23%
65 to 74 years	1,273	1,671	3,703	31.26%	121.60%
75 to 84 years	738	785	1,445	6.37%	84.08%
85 years +	258	313	462	21.32%	47.60%

Source: U.S. Census Bureau, Population Estimates, Annual Estimates of the Resident Population for Selected Age Groups

With an increasingly aging population, it is likely that there will be greater demands for healthcare and other age-appropriate services in the region. Older age groups are often retirees on fixed incomes. The declining numbers of younger people in the region suggests a shrinking current and future labor force. With an aging population, community development and planning may need to be reoriented to create appropriate services and infrastructure to suit different age groups. Figure 8 illustrates the median age of the population in the Lowcountry in 2018.

Figure 8: Median Age by Census Tract 2018



Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Median Age by Sex

Population Diversity

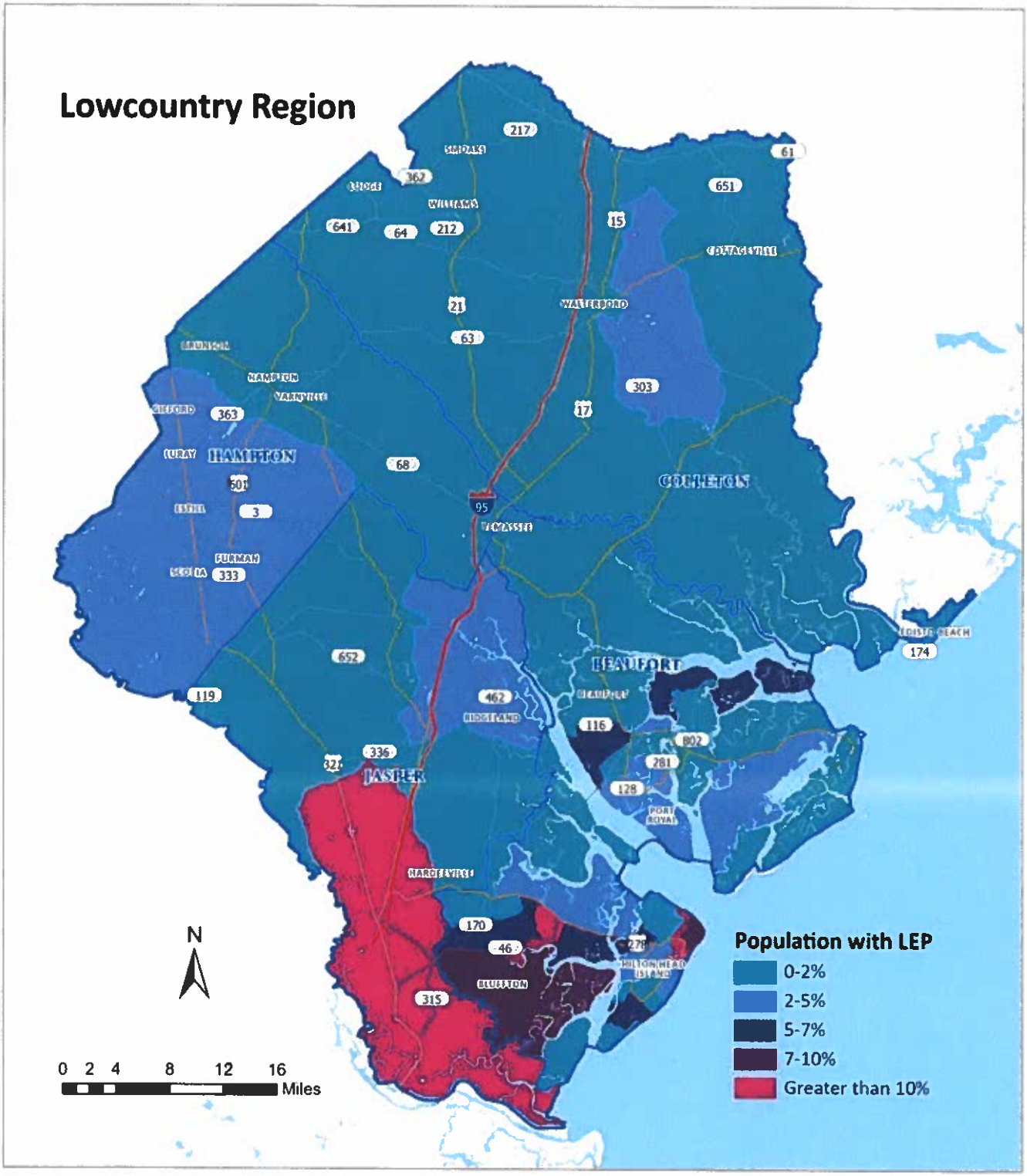
As shown in Table 4, each county has had significant changes in the population's composition. Historically the area's population was almost entirely composed of Blacks and whites, with relatively small numbers of Asians, Hispanics, and Native Americans. Between 2000 and 2010, there was an influx of Hispanics to the region, with the largest increases in Beaufort and Jasper Counties. The Hispanic population has continued to grow in the region from 2010 to 2018, although at a significantly lower rate. This growth is correlated to areas with populations who have limited English proficiency (see Figure 9).

Table 4: Race and Ethnicity 2000-2018

	Year	Total Population	Total White	Total Black	Total Hispanic
Beaufort County	2000	120,937	85,451	29,005	8,208
	2010	162,233	124,690	31,942	19,567
	2018	188,715	147,015	34,379	21,060
Percent Change	2000-2010	34.10%	45.90%	10.10%	138.40%
	2010-2018	16.32%	17.90%	7.63%	7.63%
Colleton County	2000	38,264	21,245	16,140	551
	2010	38,892	22,626	15,242	1,094
	2018	37,660	22,449	14,025	1,274
Percent Change	2000-2010	1.60%	6.50%	-5.60%	98.50%
	2010-2018	-3.17%	-0.78%	-7.98%	16.45%
Hampton County	2000	21,386	9,173	11,906	547
	2010	21,090	9,241	11,435	744
	2018	19,351	8,481	10,388	800
Percent Change	2000-2010	-1.40%	0.70%	-4.00%	36.00%
	2010-2018	-8.25%	-8.22%	-9.16%	7.53%
Jasper County	2000	20,678	8,766	10,895	1,190
	2010	24,777	12,643	11,540	3,752
	2018	28,971	15,826	12,178	3,828
Percent Change	2000-2010	19.80%	44.20%	5.90%	215.30%
	2010-2018	16.93%	25.18%	5.53%	2.03%
Lowcountry	2000	201,265	124,635	67,946	10,496
	2010	246,992	169,200	70,159	25,157
	2018	274,697	193,771	70,970	26,962
Percent Change	2000-2010	22.72%	35.76%	3.26%	139.68%
	2010-2018	11.22%	14.52%	1.16%	7.17%

Note: The whites, Blacks, and Hispanics add up to more than the total county populations because Hispanics have been counted as members of one or more of the other races as well.
Source: U.S. Census Bureau, Population Estimates, Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin

Figure 9: Population with Limited English Proficiency (LEP) by Census Tract 2018



Note: Population with LEP refers to percent population 5 years and over who speak English less than very well.
Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Language Spoken at Home

2.3 LOWCOUNTRY HOUSING

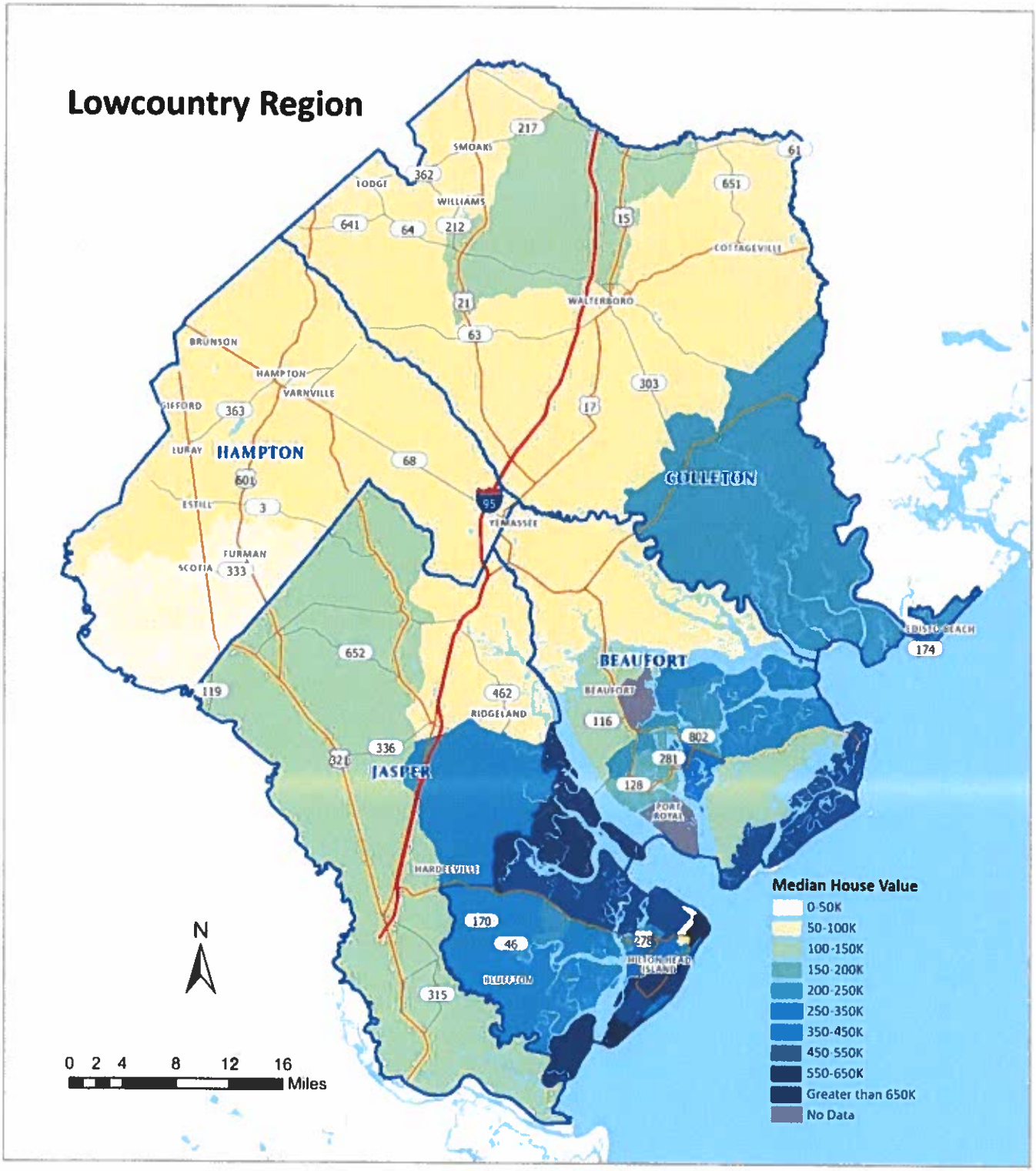
Table 5 provides a historic perspective of housing growth in the Lowcountry. The data shows several trends, including the significant reduction in the growth of total housing units from 2010 to 2018 compared to the percent growth of previous decades. In the same period, the median house price had decreased except for Jasper County. Figure 10 illustrates the median house price in the Lowcountry in 2018. The majority of the Lowcountry's housing units were built between 1970 and 2009. These details are shown in Table 6.

Table 5: Housing Stock 2000-2018

County	Units and Value	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Beaufort	**Total Housing Units**	**60,509**	**93,023**	**97,831**	**53.73%**	**5.17%**
	Occupied Units	45,532	64,945	70,607	42.64%	8.72%
	Percent Occupied	73.2%	70.6%	72.2%	-3.55%	2.27%
	Vacant Units	14,977	28,078	27,224	87.47%	-3.04%
	Percent Vacant	24.8%	30.2%	27.8%	21.77%	-7.95%
	Median House Price	$213,900	$290,900	$288,900	36.00%	-0.69%
Colleton	**Total Housing Units**	**18,129**	**19,901**	**20,015**	**9.77%**	**0.57%**
	Occupied Units	14,470	15,131	15,145	4.57%	0.09%
	Percent Occupied	80.3%	75%	75.7%	-6.60%	0.93%
	Vacant Units	3,659	4,770	4,870	30.36%	2.10%
	Percent Vacant	20.2%	24.0%	24.3%	18.81%	1.25%
	Median House Price	$73,200	$90,000	$85,100	22.95%	-5.44%
Hampton	**Total Housing Units**	**8,582**	**9,140**	**9,140**	**6.50%**	**0.00%**
	Occupied Units	7,444	7,598	6,924	2.07%	-8.87%
	Percent Occupied	78.1%	73.7%	75.8%	-5.63%	2.85%
	Vacant Units	1,138	1,542	2,216	35.50%	43.71%
	Percent Vacant	13.3%	16.9%	24.2%	27.07%	43.20%
	Median House Price	$62,300	$79,600	$73,000	27.77%	-8.29%
Jasper	**Total Housing Units**	**7,928**	**10,299**	**11,562**	**29.91%**	**12.26%**
	Occupied Units	7,042	8,517	9,982	20.95%	17.20%
	Percent Occupied	77.7%	68.9%	86.3%	-11.33%	25.25%
	Vacant Units	886	1,782	1,580	101.13%	-11.34%
	Percent Vacant	11.2%	17.3%	13.7%	54.46%	-20.81%
	Median House Price	$77,600	$118,700	$154,400	52.96%	30.08%

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Selected Housing Characteristics

Figure 10: Median House Value by Census Tract 2018



Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Selected Housing Characteristics

Table 6: Housing Stock by Year Built 2018

County	Year Built	Housing Units	Percent of Total Housing Units
Beaufort	**Total Housing Units**	**97,831**	**100.0%**
	2014 or Later	2,520	2.6%
	2010 to 2013	2,955	3.0%
	2000 to 2009	28,458	29.1%
	1990 to 1999	21,169	21.6%
	1980 to 1989	21,625	22.1%
	1970 to 1979	13,429	13.7%
	1960 to 1969	3,240	3.3%
	1950 to 1959	2,852	2.9%
	1940 to 1949	692	0.7%
	1939 or Earlier	891	0.9%
Colleton	**Total Housing Units**	**20,015**	**100.0%**
	2014 or Later	241	1.2%
	2010 to 2013	207	1.0%
	2000 to 2009	2,561	12.8%
	1990 to 1999	4,981	24.9%
	1980 to 1989	4,367	21.8%
	1970 to 1979	3,566	17.8%
	1960 to 1969	1,656	8.3%
	1950 to 1959	1,310	6.5%
	1940 to 1949	540	2.7%
	1939 or Earlier	586	2.9%
Hampton	**Total Housing Units**	**9,140**	**100.0%**
	2014 or Later	15	0.2%
	2010 to 2013	299	3.3%
	2000 to 2009	899	9.8%
	1990 to 1999	2,078	22.7%
	1980 to 1989	1,677	18.3%
	1970 to 1979	1,676	18.3%
	1960 to 1969	1,081	11.8%
	1950 to 1959	617	6.8%
	1940 to 1949	302	3.3%
	1939 or Earlier	496	5.4%
Jasper	**Total Housing Units**	**11,562**	**100.0%**
	2014 or Later	604	5.2%
	2010 to 2013	1,086	9.4%
	2000 to 2009	2,515	21.8%
	1990 to 1999	2,504	21.7%
	1980 to 1989	1,877	16.2%
	1970 to 1979	1,230	10.6%
	1960 to 1969	739	6.4%
	1950 to 1959	439	3.8%
	1940 to 1949	380	3.3%
	1939 or Earlier	188	1.6%

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Selected Housing Characteristics

2.4 LOWCOUNTRY ECONOMY

Employment

A useful picture of jobs and employment comes from comparing the labor force and employment numbers with those from the past. Table 7 shows that Beaufort and Jasper Counties have seen an increase in labor force since 2010. The Lowcountry region's unemployment rate has continued to fall during this period.

According to the South Carolina Department of Employment and Workforce (SCDEW), in 2020, the top five industries that employ Lowcountry residents include ambulatory health care services, food services and drinking places, heavy and civil engineering construction, real estate, and administrative and support services.

Table 7: Employment 2000-2019

County	Income Type	2000	2010	2019	Percent Change 2000-2010	Percent Change 2010-2019
Beaufort	Civilian Labor Force	51,639	65,336	77,858	26.5%	19.2%
	Number of Employed	49,972	59,684	75,797	19.4%	27.0%
	Number of Unemployed	1,667	5,652	2,061	239.1%	-63.5%
	Unemployment Rate	3.2%	8.7%	2.6%	171.9%	-70.1%
Colleton	Civilian Labor Force	16,110	16,827	16,821	4.5%	0.0%
	Number of Employed	15,479	8,784	16,283	-43.3%	85.4%
	Number of Unemployed	631	2,314	538	266.7%	-76.8%
	Unemployment Rate	3.9%	13.8%	3.2%	253.8%	-76.8%
Hampton	Civilian Labor Force	8,412	8,785	8,416	4.4%	-4.2%
	Number of Employed	9,039	7,659	8,187	-15.3%	6.9%
	Number of Unemployed	373	1,126	229	201.9%	-79.7%
	Unemployment Rate	4.4%	12.8%	2.7%	190.9%	-78.9%
Jasper	Civilian Labor Force	9,294	10,896	12,685	17.2%	16.4%
	Number of Employed	8,952	9,823	12,363	9.7%	25.9%
	Number of Unemployed	342	1,073	322	213.7%	-70.0%
	Unemployment Rate	3.7%	9.8%	2.5%	164.9%	-74.5%

Source: SC WORKS, Labor Force Employment and Unemployment (LAUS)

Income

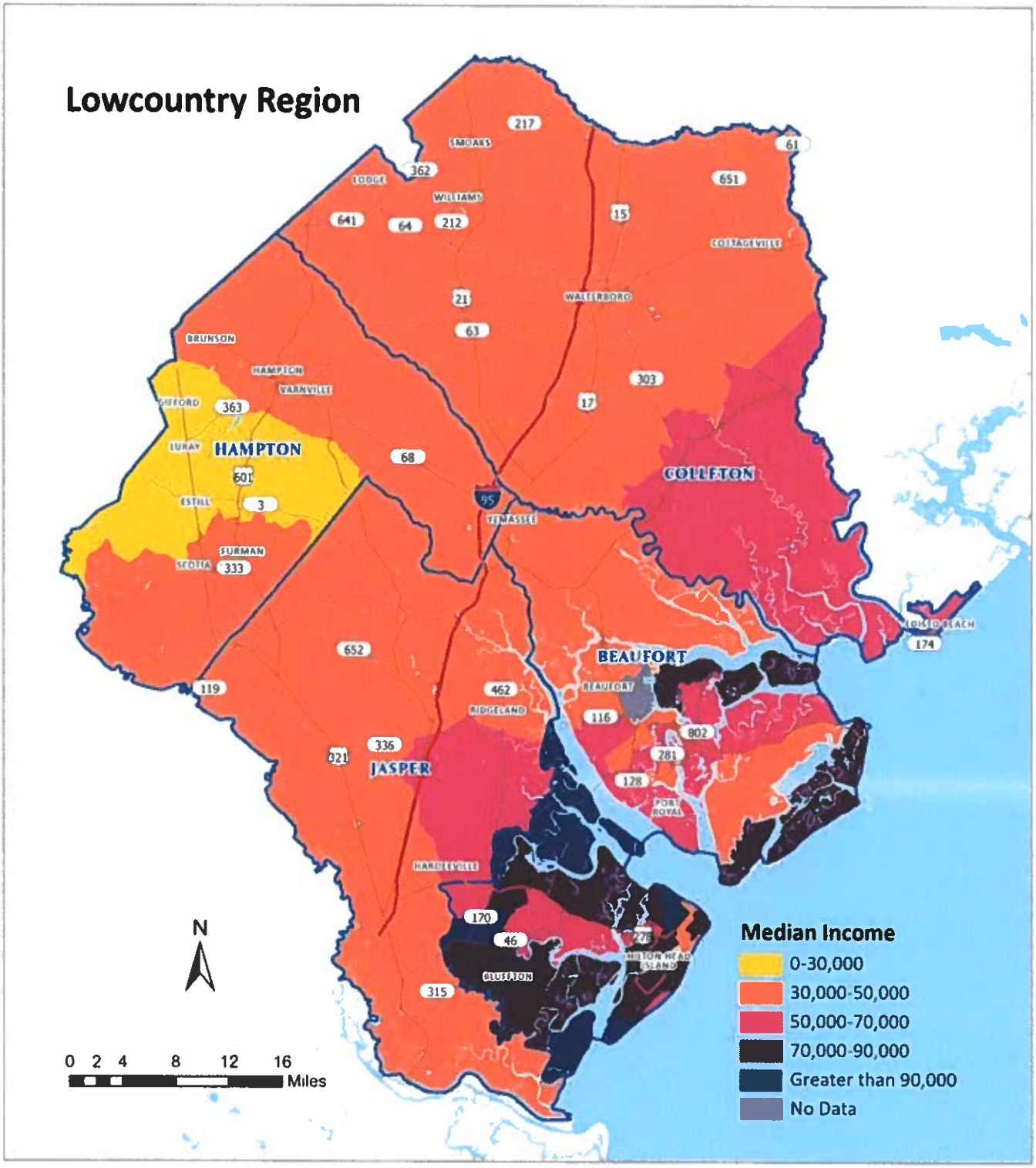
Incomes are distributed unevenly in the Lowcountry with Beaufort County reporting higher median household and per capita incomes than the state since 2000. Table 8 shows substantial increases in all income measures in all four counties from 2000 to 2018, however, with the inflation adjustment, all median incomes have decreased since 2000. Between 2010 and 2018, inflation-adjusted median household incomes had declined in all four counties, while inflation-adjusted per capita incomes had decreased in Beaufort and Hampton Counties. Figure 11 illustrates the median household income in the Lowcountry in 2018.

Table 8: Income Measures 2000-2018

County	Income Type	2000	2010	2018	Percent Change 2000-2010	Percent Change 2010-2018
Beaufort	Median Household Income	$46,992	$55,286	$63,110	17.65%	14.15%
	Adjusted Median Household Income	$67,604	$63,925	$63,110	-5.44%	-1.27%
	Per Capita Income	$25,377	$32,731	$36,306	28.98%	10.92%
	Adjusted Per Capita Income	$36,882	$37,845	$36,306	2.61%	-4.07%
Colleton	Median Household Income	$29,733	$33,263	$36,276	11.87%	9.06%
	Adjusted Median Household Income	$43,213	$38,460	$36,276	-11.00%	-5.68%
	Per Capita Income	$14,831	$17,842	$21,003	20.30%	17.72%
	Adjusted Per Capita Income	$21,555	$20,630	$21,003	-4.29%	1.81%
Hampton	Median Household Income	$28,771	$34,846	$32,453	21.12%	-6.87%
	Adjusted Median Household Income	$41,815	$40,291	$32,453	-3.64%	-19.45%
	Per Capita Income	$13,129	$16,262	$17,523	23.86%	7.75%
	Adjusted Per Capita Income	$19,081	$18,803	$17,523	-1.46%	-6.81%
Jasper	Median Household Income	$30,727	$37,393	$41,930	21.69%	12.13%
	Adjusted Median Household Income	$44,657	$43,236	$41,930	-3.18%	-3.02%
	Per Capita Income	$14,161	$17,997	$22,406	27.09%	24.50%
	Adjusted Per Capita Income	$20,581	$20,809	$22,406	1.11%	7.67%
South Carolina	Median Household Income	$37,082	$43,939	$51,015	18.49%	16.10%
	Adjusted Median Household Income	$53,894	$50,805	$51,015	-5.73%	0.41%
	Per Capita Income	$18,795	$23,443	$27,986	24.73%	19.38%
	Adjusted Per Capita Income	$27,316	$27,106	$27,986	-0.77%	3.25%

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Median Income in the Past 12 Months and Per Capita in the Past 12 Months; U.S. Bureau of Labor Statistics, Consumer Price Index (CPI) Inflation Calculator

Figure 11: Median Household Income by Census Tract 2018



Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, Median Income in the Past 12 Months

SECTION 3: HAZARDS IDENTIFICATION AND PROFILE

It is important to understand natural hazards that affect the Lowcountry region. This section details hazards relevant to the Lowcountry region with description of each hazard and its past and future occurrences.

3.1 NATURAL HAZARDS IDENTIFICATION

The natural hazard identification and profiles compiled for the 2020 Lowcountry Natural Hazard Mitigation Plan cover twelve different hazards. They are of most concern having historically affected the Lowcountry region. These hazards include:

- Tornado
- Hurricane
- Windstorm
- Lightning
- Hail
- Drought
- Earthquake
- Wildfire
- Flood
- Winter Storm
- Coastal Erosion
- Extreme Heat

Since the 2015 Plan, the Lowcountry region has faced many severe natural disaster events. The impacted areas in the four counties have received federal assistance available under emergency and major disaster declarations.

According to FEMA (2020b), all emergency and major disaster declarations are made solely at the discretion of the U.S. President. The Stafford Act §401 states in part that *"All requests for a declaration by the President that a major disaster exists shall be made by the Governor of the affected State."*

Table 9 provides all declarations related to the identified natural hazards in the Lowcountry region since 2015. The detail on public assistance funded projects can be seen in Appendix E.

Emergency Declarations

- Involve any occasion or instance when the President determines federal assistance is needed.
- Supplement State and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.
- Provide assistance (not exceed $5 million) in a single emergency.

Major Disaster Declarations

- Involve any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond.
- Provide a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work.

Emergency Work

- Category A: Debris removal
- Category B: Emergency protective measures

Permanent Work

- Category C: Roads and bridges
- Category D: Water control facilities
- Category E: Public buildings and contents
- Category F: Public utilities
- Category G: Parks, recreational, and other facilities

(Source: FEMA, 2020a & 2020f)

Table 9: Disaster Declarations 2015-2020

Declaration Date	Declaration ID	Declaration Type	Disaster	County	Assistance Type (category)
2020-05-01	DR-4542-SC	Major Disaster Declaration	Severe Storms, Tornadoes, and Straight-line Winds	Colleton and Hampton	Individual Assistance and Public Assistance (A-G)
2020-05-17	DR-4479-SC	Major Disaster Declaration	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Hampton	Public Assistance (A-G)
2019-09-30	DR-4464-SC	Major Disaster Declaration	Hurricane Dorian	Beaufort, Colleton, and Jasper	Public Assistance (A-G)
2019-09-01	EM-3421-SC	Emergency Declaration	Hurricane Dorian	Beaufort, Colleton, Hampton, and Jasper	Public Assistance (B)
2018-09-16	DR-4394-SC	Major Disaster Declaration	Hurricane Florence	Colleton	Public Assistance
				Jasper	Public Assistance (B)
2018-09-10	EM-3400-SC	Emergency Declaration	Hurricane Florence	Beaufort, Colleton, Hampton, and Jasper	Public Assistance
2017-09-16	DR-4346-SC	Major Disaster Declaration	Hurricane Irma	Beaufort, Colleton, Hampton, and Jasper	Public Assistance
2017-09-17	EM-3386-SC	Emergency Declaration	Hurricane Irma	Beaufort, Colleton, Hampton, and Jasper	Public Assistance (B)
2016-10-11	DR-4286-SC	Major Disaster Declaration	Hurricane Matthew	Beaufort, Colleton, Hampton, and Jasper	Individual Assistance and Public Assistance (A-G)
2016-10-06	EM-3378-SC	Emergency Declaration	Hurricane Matthew	Beaufort, Colleton, Hampton, and Jasper	Public Assistance (B)
2015-10-05	DR-4241-SC	Major Disaster Declaration	Severe Storms and Flooding	Beaufort	Public Assistance
				Colleton	Individual Assistance and Public Assistance
2015-10-03	EM-3373-SC	Emergency Declaration	Severe Storms and Flooding	Beaufort, Colleton, Hampton, and Jasper	Public Assistance (B)

Source: Federal Emergency Management Agency (FEMA)

Data and Terminology

The data used for hazard identification and profiles are from publicly available sources and include geospatial references. All the weather-related hazard data used in this plan have a period of record of 20 years or more, which is sufficient to cover annual and decadal variability under climate change. For the hurricane/tropical storms, data from 1988 were included to capture Hurricane Hugo as the storm of record for the state (in terms of impact). The impact data are derived from the Spatial Hazard Event and Loss Dataset for the U.S. (SHELDUS™) and represent estimates of monetary and human losses.

It is important to understand natural hazards that affect the Lowcountry region. This information will be considered in planning, preparation and developing projects and actions for community mitigation strategies.

This plan provides updated hazard data and information (2012-2019) on:

- Characteristics and Classification: A brief description of and Identification of relevant data regarding each hazard.
- Location and Extent: The location of past occurrences and notable hazard events and the strength or magnitude of the hazard.
- Future Probability: The probability data of each hazard occurring in any given year.

Terminology for Future Probability

- *Total counts:* The overall number of events, instances, or damages in the period of record, or a specified time frame such as 2012-2019.
- *Annualized counts:* The average number of events, instances, or damages per year in the period of record or specified time frame such as 2012-2019.
- *Period of record:* The inclusive years (time frame) for which reported geospatial data are available at county or sub-county geographies.
- *Recurrence frequency:* The expected time (in years) between occurrences of events or instances, based on past events regardless of magnitude or intensity. It is the number of years in the record/ number of events.
- *Future probability (% chance of occurrence):* The likelihood (or percent chance of occurrence) per year. It is the number events or instances/by the number of years in the record or specified time frame, multiplied by 100.
- In some instances, the probability of the event occurring with a given magnitude at a specific location has been predetermined such as the 100-year flood plain. In this example, the 100-year floodplain represents a 2% chance of a flood of that magnitude in a given year. We provide those modeled probabilities where available.

3.2 TORNADO

Characteristics and Classification

According to National Severe Storms Laboratory (NSSL) (2020a), a tornado is a violently rotating column of air that extends from a thunderstorm cloud to the ground. Tornadoes are some of the most violent events present in the atmosphere as winds can reach 300 mph. The National Weather Service issues a *tornado watch* when there are favorable conditions for tornadic formulation well in advance to allow the population affected to stay alert for severe weather. A *tornado warning* is issued if a tornado has been reported in the area either on radar or by individuals and requires immediate protective actions by the warned population.

Since 1950, there have been numerous tornadoes in South Carolina. The State averages approximately eleven tornadoes a year, which ranks twenty-sixth in the nation for tornado strikes causing damage. Tornadoes have claimed forty-seven casualties in South Carolina and have injured 1,057 residents since 1950 (SCEMD, 2020a).

Tornado intensity and severity are measured using the Fujita Scale, which assigns a rating based on damages. The National Weather Service implemented the Enhanced Fujita Scale (EF-Scale) in 2007 to update the older Fujita Scale. The Enhanced Fujita Scale (EF-Scale) takes more variables into account and produces more consistent and accurate tornado ratings, still ranging from EF-0 (weakest) to EF-5 (strongest) (SPC, 2020). These variables cover structures, trees, construction types, and more.

Table 10: Enhanced Fujita Scale for Tornado Damage

Scale	Typical Damage
EF-0 (65-85 mph)	Light damage – Peels surface off some roofs, some damage to gutters or siding, broken off trees, and shallow-rooted trees pushed over.
EF-1 (86-110 mph)	Moderate damage – Roofs severely stripped, mobile homes overturned or badly damaged, loss of exterior doors, and windows and other glass broken.
EF-2 (111-135 mph)	Considerable damage – Roofs torn off well-constructed houses, foundations of frame homes shifted, mobile homes completely destroyed, large trees snapped or uprooted, light-object missiles generated, and cars lifted off ground.
EF-3 (136-165 mph)	Severe damage – Entire stories of well-constructed houses destroyed, severe damage to large buildings such as shopping malls, trains overturned, trees debarked, heavy cars lifted off the ground and thrown, and structures with weak foundations blown away some distance.
EF-4 (166-200 mph)	Devastating damage – Whole frame houses well-constructed houses and whole frame houses completely leveled, and cars thrown and small missiles generated.
EF-5 (>200 mph)	Incredible damage – Strong frame houses leveled off foundations and swept away, automobile-sized missiles fly through the air in excess of 100 m (109 yd), high-rise buildings have significant structural deformation, incredible phenomena will occur.
EF No rating	Inconceivable damage – Should a tornado with the maximum wind speed in excess of EF-5 occur, the extent and types of damage may not be conceived.

Source: Storm Prediction Center (SPC)

Location and Extent

Sixty-nine tornados have touched down in the Lowcountry since 1950. The majority of these were in Beaufort and Colleton Counties. Over half of these resulted in some damage and/or a human injury or death. For the 2012-2019 period there were eight tornado touchdowns (Figure 12) in the following areas:

Beaufort County

Beaufort County has experienced two tornadoes between 2012-2019 with no damage reported. These events include:

- July 13, 2013: An EF-0 tornado touchdown in Frogmore. A waterspout formed offshore and possibly moved onshore on Hunting Island before moving back over the water and dissipating. No damage was reported since it moved over marshland.

City of Beaufort

- June 23, 2014: An EF-0 tornado touchdown in City of Beaufort. A waterspout developed and remained nearly stationary over the river near Waterfront Park.

Towns of Bluffton, Hilton Head Island, and Port Royal

- There was no record of tornado events in these towns.

Colleton County

Between 2012-2019, Colleton County has experienced four tornadoes which caused $136,713 in financial loss and no injuries or deaths. The notable events include:

- February 24, 2012: An EF-1 tornado touched down south of Islandton and traveled 2 miles east toward SC-63 where it lifted. The event damaged several structures and toppled trees and power lines. Damages totaled $136,713.
- May 4, 2017: An EF-1 tornado in Colleton County adjacent to I-95 near the Hendersonville rest area caused damage to houses, trees, power lines, and displaced mobile homes from their original positions. There were no figures reported for damage amounts.

City of Walterboro and the Towns of Cottageville, Edisto Beach, Lodge, Smoaks, and Williams.

- There was no record of tornado events in these city and towns.

Hampton County

Below is the only tornado event in Hampton County between 2012-2019 with no financial loss and no injuries or deaths.

Town of Gifford

- April 3, 2017: An EF-0 tornado touched down about 2.7 miles east of Gifford then traveled approximately one third of a mile east-northeast before lifting near Thomas Hamilton Road. The damage was limited to uprooting of small soft and hardwood trees.

Towns of Brunson, Estill, Furman, Hampton, Luray, Scotia, Varnville, and Yemassee

- There was no record of tornado events in these towns.

Jasper County

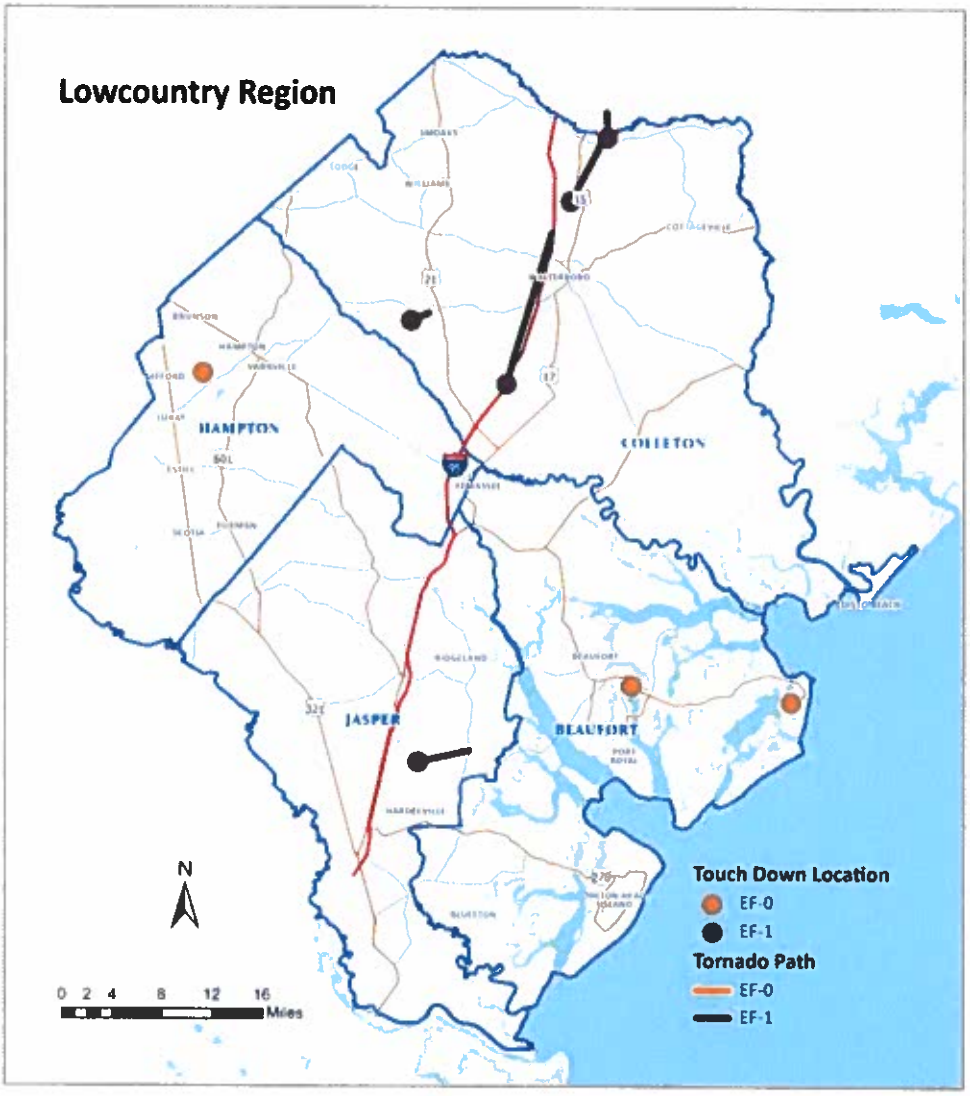
The following is a tornado event in Jasper County inflicting $437 thousand in damages.

- June 11, 2012: An EF-1 tornado touched down between the communities of Okatie and Switzerland and traveled four miles northeast where it lost ground contact near the intersection of SC-462 and Snake Road. The event took out hundreds of trees.

City of Hardeeville and Town of Ridgeland

- There was no record of tornado events in these jurisdictions. However, considerable damage to trees was found south of Ridgeland with a damage pattern consistent with a tornado.

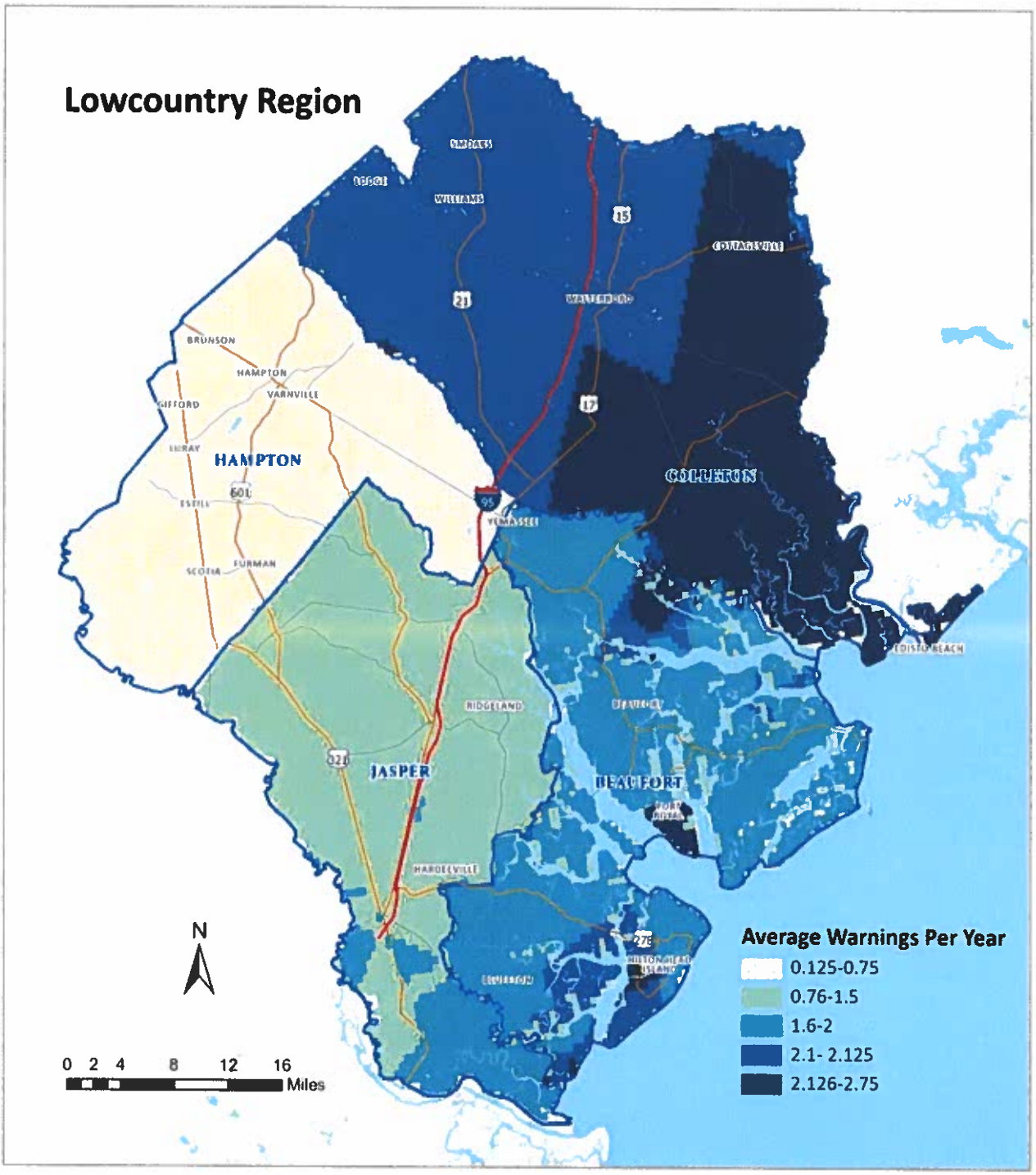
Figure 12: Tornado and Tornado Track 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Another way to gauge the potential risk of tornadic activity in the region is to examine tornado warnings issued by the U.S. Weather Service. Not all warnings result in a tornado touchdown, but such warnings provide a proxy for the likely location and frequency of tornados (Figure 13). For the Lowcountry region, the highest annual average of warnings occurred in Colleton County, Beaufort County, and the Town of Hilton Head Island.

Figure 13: Tornado Warnings 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Future Probability

Tornado events are random in their geographic patterns. While they can occur during any time of the year, they are most prevalent in the spring and summer months, and during the Atlantic hurricane season, which occurs from June to November. Tornado events are relatively low frequency and less than 100% chance of occurring in any given year as shown in Table 11.

Table 11: Tornado Historical and Recent Hazards Events 1986-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**17**	**33**	**0.5**	**1.94**	**52%**	**2**
City of Beaufort	3	33	0.1	11.00	9%	1
Town of Bluffton	3	33	0.1	11.00	9%	0
Town of Hilton Head Island	2	33	0.1	16.50	6%	0
Town of Port Royal	0	33	0.0	*	*	0
Colleton County	**17**	**33**	**0.5**	**1.94**	**52%**	**4**
Town of Cottageville	0	33	0.0	*	*	0
Town of Edisto Beach	0	33	0.0	*	*	0
Town of Lodge	0	33	0.0	*	*	0
Town of Smoaks	1	33	0.0	33.00	3%	0
City of Walterboro	2	33	0.1	16.50	6%	0
Town of Williams	0	33	0.0	*	*	0
Hampton County	**8**	**33**	**0.2**	**4.13**	**24%**	**1**
Town of Brunson	1	33	0.0	33.00	3%	0
Town of Estill	0	33	0.0	*	*	0
Town of Furman	0	33	0.0	*	*	0
Town of Gifford	1	33	0.0	33.00	3%	1
Town of Hampton	3	33	0.1	11.00	9%	0
Town of Luray	0	33	0.0	*	*	0
Town of Scotia	0	33	0.0	*	*	0
Town of Varnville	1	33	0.0	33.00	3%	0
Town of Yemassee	0	33	0.0	*	*	0
Jasper County	**6**	**33**	**0.2**	**5.50**	**18%**	**1**
City of Hardeeville	3	33	0.1	11.00	9%	0
Town of Ridgeland	1	33	0.0	33.00	3%	0

Note: Symbol (*) refers to "no value" because the hazard events have a value of zero.
Source: Hazards and Vulnerability Research Institute (HVRI) and NOAA's Storm Events Database

3.3 HURRICANE

Characteristics and Classification

Tropical cyclones originate over warm tropical waters in the northern hemisphere and have closed, circulating winds that rotate in a counterclockwise direction. Tropical depressions, tropical storms, and hurricanes are examples of tropical cyclones. Tropical depressions have maximum sustained surface wind speeds up to 38 mph. When wind speeds reach a sustained level of 39 mph or more, the system is formally classified as a tropical storm and receives a name. When the winds reach a sustained 74 mph the event is re-classified to a hurricane.

Hurricanes come in varying intensities measured by the Saffir-Simpson Hurricane Wind Scale. The scale ranges from one to five with higher numbers representing higher wind speeds and stronger storms. Once a storm reaches Category 3 (111 mph sustained winds) it is considered a Major Hurricane due to its increased potential to cause significant loss as shown in Table 12 (NHC, 2020a).

Table 12: Hurricane Category Description

Category	Sustained Wind	Types of Damage Due to Hurricane
1	74-95 mph 64-82 kt 119-153 km/h	*Very dangerous winds will produce some damage:* Well-constructed frame homes could have damage to roof, shingles, and vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	*Extremely dangerous winds will cause extensive damage:* Well-con- structed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 96-112 kt 178-208 km/h	*Devastating damage will occur:* Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	*Catastrophic damage will occur:* Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	*Catastrophic damage will occur:* A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center (NHC)

According to the National Hurricane Center (NHC) (2020b) and National Weather Service (2020a), there are four different hazards associated with tropical storms and hurricanes.

Strong Winds

Winds are the defining factor for tropical storms and hurricanes. The onset of tropical storm force winds ends preparedness activities such as evacuations as those wind speeds pose a danger to people and structures. Hurricane-force winds (74 mph and up) can occur at some distances from the eye of the storm. They can destroy structures and can turn regular debris into airborne hazards.

Heavy Rain

Tropical cyclones have enormous potential for precipitation and can carry that potential far inland. Widespread heavy precipitation gives rise to inland and flash flooding. Flooding in low-lying areas can persist for days. Rainfall is usually worse during larger storms and slower storms. In 2016, Hurricane Matthew dropped six to twelve inches of rain across the coast which led to significant freshwater flooding.

Tornadoes

Tropical cyclones are capable of spawning tornadoes. Most commonly these tornadoes occur in rain bands well-removed from the storm's eye, but it is possible for them to appear near the eyewall. Typically, these tornadoes are weak, but tornadoes of any strength can cause destruction and loss of life.

Storm Surge

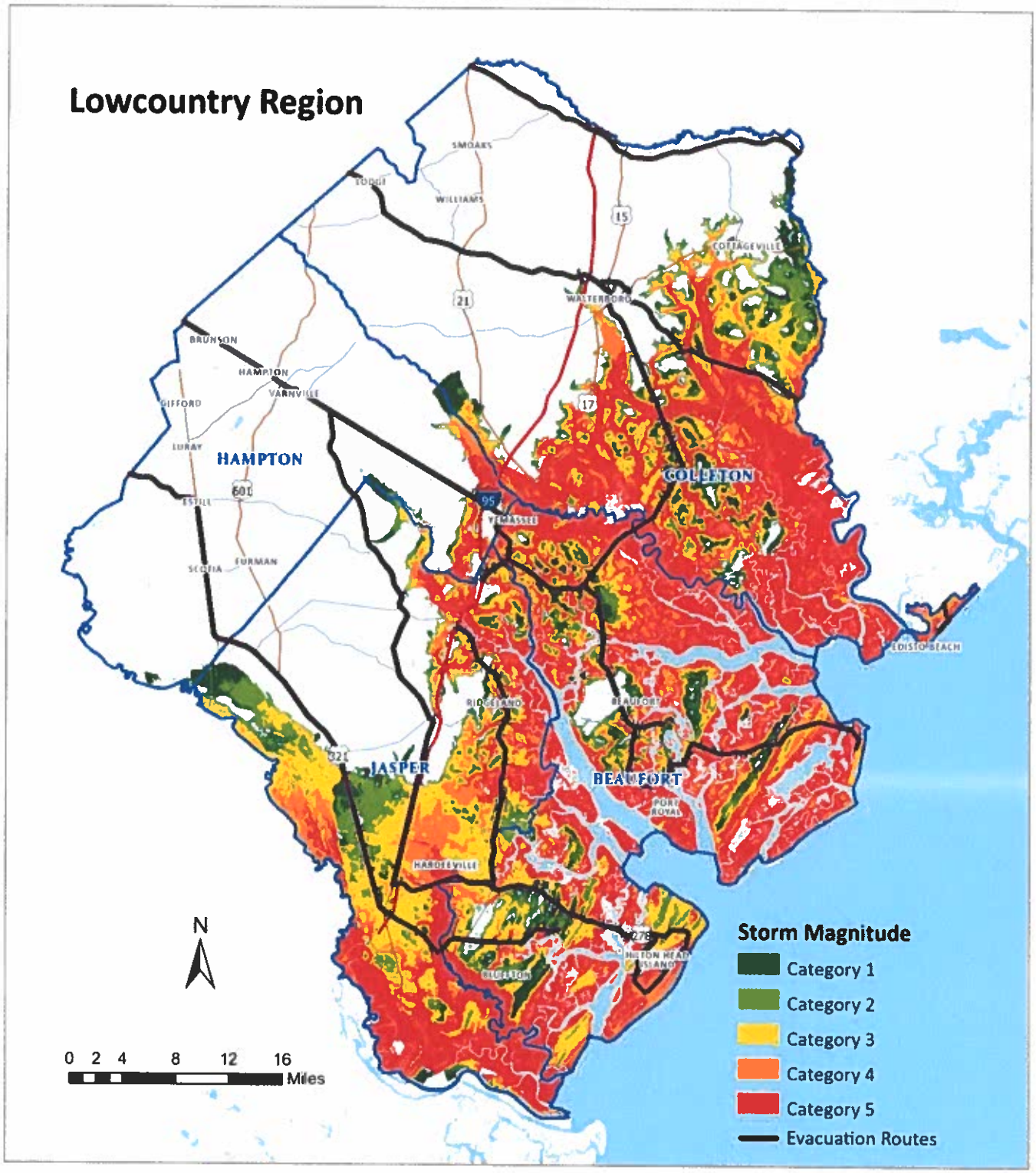
Hurricanes and tropical storms can push sea water up to 20 feet higher than normal tides, due to the strong winds, forward speed, and the low pressure associated with the storms. Storm surge is highest in the upper right quadrant near the north side of the storm's eye. For example, if the storm surge is added to the top of a high tide, the coastal flooding and surge will be exacerbated, whereas a low tide has the potential to mitigate those effects. High seas can erode beaches, destroy buildings, and ruin coastal structures such as docks or revetments. As a hurricane's path and timing are narrowed upon its approach to land, scientists use the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model to predict the storm surge that may occur (Figure 14).

The SLOSH model uses factors in its calculations such as the underwater terrain, wind speeds, storm direction, and the shape of the coastline (UCAR, 2020). In 2017, the National Hurricane Center (NHC) (2019a) began issuing graphics detailing storm surge warnings and watches as part of its suite of warning products and messaging.

All four counties in the Lowcountry are at significant risk for storm surge with the potential of stretching inland as far as I-95 in places with a category 1 hurricane. Storm surge risk is a major issue for coastal evacuation in Beaufort, Colleton, and Jasper Counties.

Storm surge measurements for the Lowcountry region are obtained from the National Weather Service's Fort Pulaski, GA Tide Gauge.

Figure 14: Storm Surge Risk



Source: Hazards and Vulnerability Research Institute (HVRI), based on NOAASLOSH Model Run Outputs

Location and Extent

Throughout the long period of record of hurricanes and their paths, there has been only one major hurricane (Hurricane Gracie, a category 4 storm which made landfall near Edisto Island in 1959) to make landfall or pass through the Lowcountry region (Historical Hurricane Tracks, 2020). Tropical storms are the most prevalent in the Lowcountry. (Table 13 and Figure 15).

Table 13: Storm Tracks Affecting the Lowcountry Region 1850-2019

Type of Storm	Number Passing through the Region	Number Passing within 50 Nautical Miles of Region	Recent (2012-2019) Passing Through or Within 50 Nautical Miles
Hurricane-Category 5	0	0	0
Hurricane-Category 4	1	2	0
Hurricane-Category 3	0	4	0
Hurricane-Category 2	5	10	1
Hurricane-Category 1	8	16	0
Tropical Storm	19	61	7
Tropical Depression	12	33	0
Subtropical Storm	1	3	0
Subtropical Depression	1	3	0
Extratropical Storms	8	9	0
Total	**55**	**141**	**8**

Source: Historical Hurricane Tracks

When Hurricanes strike the Lowcountry, the extent of the impact often encompasses the entire region. Since 2012, three tropical storms transected the Lowcountry region. Hurricane Hermine (September 2, 2016) moved from the Gulf of Mexico through the Florida panhandle, then northeast through southern Georgia, before transecting the South Carolina coastal counties as a tropical storm. The sustained winds in the Lowcountry reached 34 mph, and damage was mostly constrained to downed trees and power lines.

While no hurricane tracks traversed the region since 2012, a number of hurricanes passed within 50 nautical miles of the coast. These hurricanes produced enough damage in the region to warrant Presidential Disaster Declarations (PDD). According to FEMA (2020a), these include:

Hurricane Joaquin – 2015 (DR-4241-SC) - Public Assistance for Beaufort County and Individual Assistance and Public Assistance for Colleton County

Joaquin, a category 4 hurricane, made landfall on several islands of the Bahamas on October 1-2, 2015, reaching estimated maximum sustained winds of 120 kt (138 mph) on October 2. Moisture from Joaquin contributed to a multi-day rainfall event that caused historic flooding in Charleston and Columbia. Rainfall amounts exceeding 15 inches occurred in the area extending from the South Carolina Lowcountry northwestward through the Midlands. (NHC, 2016).

Hurricane Matthew – 2016 (DR-4286-SC) – Individual Assistance and Public Assistance for Beaufort, Colleton, Hampton, and Jasper Counties

Matthew travelled over the Caribbean as a Category 4 storm but then traveled north-northwest paralleling the Southeast coast and weakening as it moved north. Hurricane Matthew made its last landfall on October 8, 2016 near McClellanville, SC as a weak Category 1 hurricane (75 mph winds). The strongest sustained winds that the Lowcountry measured were 58 kts (66.7 mph). The storm surge at Fort Pulaski in nearby Georgia was 7.7 ft above normal tides, resulting in three to five feet of inundation. Matthew also brought 16.9 inches of rain to a gauge at Edisto Island. Beaufort County received some of the most extensive damage in the state; highways were flooded and damaged, boats washed ashore, and many structures and trees were damaged in winds gusts of up to 95 kts (109.3 mph). The Town of Edisto Beach (Colleton County) was also especially hard-hit, losing power, road access and suffering structural damage. There was severe coastal erosion on Fripp Island and Edisto Island. (NCEI, 2020a and NHC, 2017).

Hurricane Irma – 2017 (DR-4346-SC) – Public Assistance for Beaufort, Colleton, Hampton, and Jasper Counties

Irma skirted up the Florida peninsula in September of 2017. Irma's sustained winds during its final landfall were 97 kts (111.6 mph), which weakened as it travelled Northwest farther onto shore. Areas throughout Georgia and South Carolina experienced tropical storm force winds as a result, with Charleston measuring gusts of 52 kts (59.8 mph), and sustained winds of 42 kts (48.3 mph). The storm also brought a surge of 4.7 ft to Fort Pulaski. Although the surge was less than that of Matthew, higher tides coinciding with the surge resulted in greater inundation than seen the year before. Irma brought nine inches of rain to Beaufort over the span of three days and caused substantial coastal erosion on Edisto Beach. Irma damaged trees, powerlines, sea walls, homes, and airports (NHC, 2018).

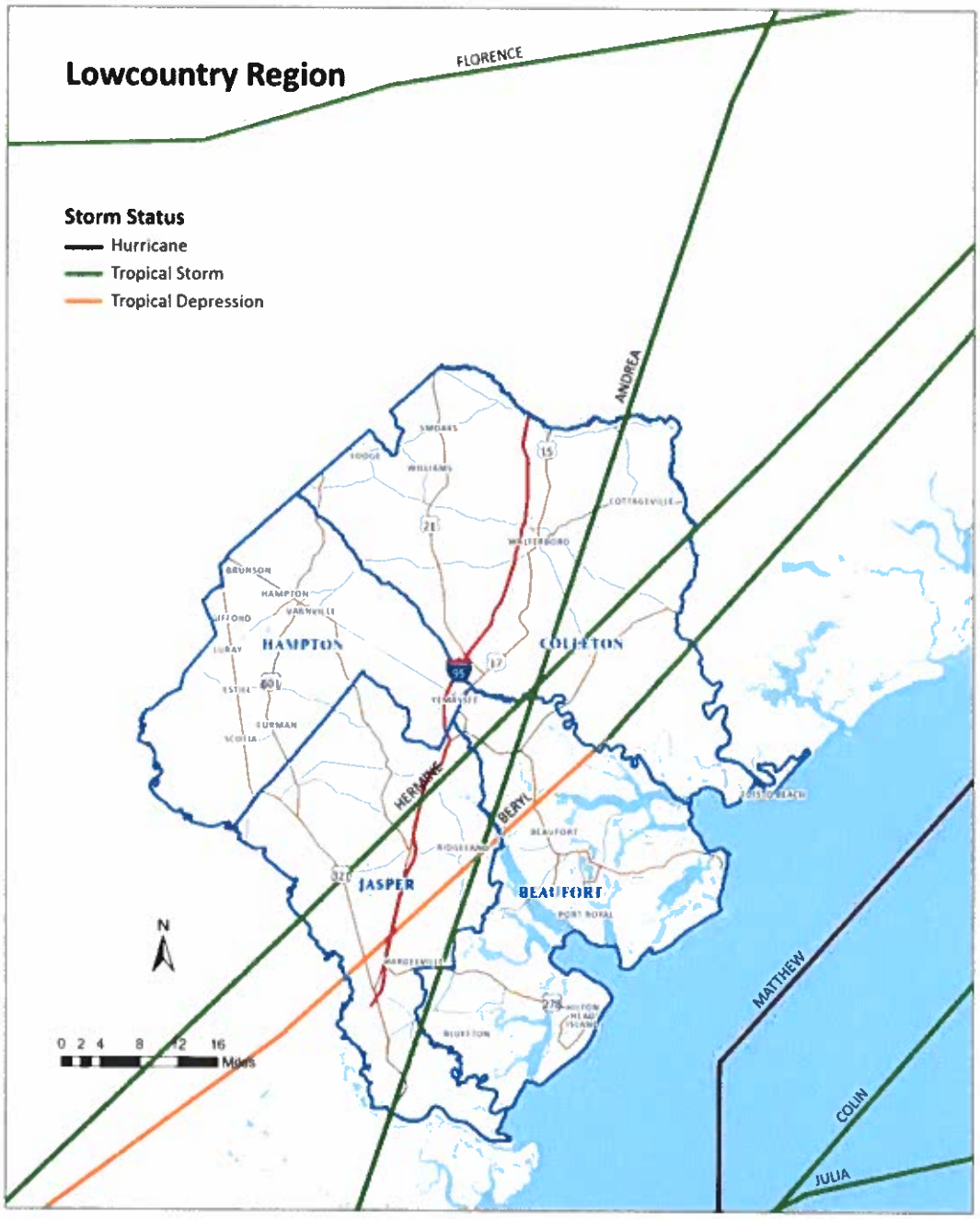
Hurricane Florence – 2018 (DR-4394-SC) – Public Assistance for Colleton County and Public assistance (category B) for Jasper County

Florence made landfall in southern North Carolina in mid-September of 2018. Florence carried windspeeds of 80 kts (90 mph) upon landfall and continued in a Southwest direction through northern South Carolina, dissipating as it trudged through the state. The storm lingered in the region, dropping significant rain across the state, leaving lowland floods in its wake. The northern portions of the state suffered most of the damage (NHC, 2019).

Hurricane Dorian – 2019 (DR-4464-SC) – Public Assistance for Beaufort, Colleton, and Jasper Counties

Dorian skimmed the coast of the Carolinas in September of 2019. Coastal areas in South Carolina experienced 45 to 55 kts (51.7-63.2 mph) sustained winds, two to four feet of storm surge, and heavy rainfall. Pawley's Island received the most rain in the state with 15.21 inches. There were no casualties in South Carolina. Some areas lost power due to heavy winds knocking over trees and powerlines (NHC, 2020c).

Figure 15: Hurricane and Tropical Storm Tracks 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI), based on the International Best Track Archive for Climate Stewardship (IBTrACS), Tropical Cyclone Best Track Data

Beaufort County

Between 2012-2019, there were eight hurricanes and tropical storms that have affected the county with $263,586 in financial loss, and no report deaths or injuries. The following are the notable events.

- October 7, 2016: A Hurricane Matthew scattered tree damage and significant power outages in the county. Tree and structural damage increased with southward progress along U.S. 21. Damage was consistent with wind gusts around 100 mph. Extensive shingle/roof damage occurred to about 50% of homes on Harbor Island, consistent with wind gusts 100-110 mph.
- September 2, 2016: A passage of Tropical Storm Hermine with a peak wind gust of 45 miles per hours blew down numerous trees across the county. Impacted communities include Laurel Bay, Lady's Island, Hilton Head, and Bluffton. Some trees blocked roadways and fell on homes and cars causing various degrees of damage.
- On May 9, 2019: The Automated Weather Observing System (AWOS) at the Beaufort County Airport measured peak sustained winds of 40 mph and a peak wind gust of 52 mph. these strong winds associated with Hurricane Dorian took down numerous trees across the county. Isolated to scattered power outages were also reported. South Carolina Highway Patrol reported a couple of unmoored boats washed ashore along Sea Island Parkway. In an unknown location in the county, three sailboats washed ashore. The event caused over $260,00 in financial loss, with no death and injuries.

City of Beaufort

- June 6, 2013: A Tropical Storm Andrea passed over the area bringing periods of heavy rain and damaging wind gusts. A tree down along North Street was reported.
- September 11, 2017: Strong winds associated with Hurricane Irma blew down numerous trees and power lines down across the city. The Automated Surface Observing Systems (ASOS) at the Beaufort Marine Corps Air Station measured peak sustained winds of 30 mph and a peak wind gust of 61 mph.

Town of Hilton Head Island

- September 2, 2016: A Tropical Storm Hermine caused significant damage to 13 homes with an estimated total damage of approximately $250,000. The wind gust was ranging from 48 to 62 miles per hour.
- On May 9, 2019: The AWOS at the Hilton Head Airport (KHXD) measured peak sustained winds of 53 mph and a peak wind gust of 67 mph. The Weather flow site at Pritchards Island near Beaufort measured peak sustained winds of 35 mph and a peak wind gust of 61 mph.

Town of Bluffton

- October 10, 2018: The Town was impacted by Topical Storm Michael included wind damage in the form of isolated to scattered trees and power lines blown down, heavy rainfall and minor levels of storm surge. There were no reports of injuries or fatalities across the area.

Town of Port Royal

- October 7, 2016: A strong wind associated with Hurricane Matthew scattered tree damage and significant power outages in the area. Port Royal Plantation was submerged in water.

Colleton County

Between 2012-2019, there were eight hurricanes and tropical storms that have affected the county with over six million in financial loss, and no report deaths or injuries. The following are the notable events.

- June 7, 2013: A Tropical Storm Andrea passes over the area bringing periods of heavy rain and damaging wind gusts. The South Carolina Department of Highways reported a tree down in many areas - near the intersection of Round O Road and Cottageville Highway, near the intersection of White Hall Road and Abberly Drive, near the intersection of Connley Road and Cross Swamp Road, and at the intersection of Bells Highway and Confederate Highway.
- October 10, 2018: A Tropical Storm Michael caused 8 trees and a few power lines down, most notably around Ritter, Hendersonville, Ruffin, Canadys, Ashepoo, and Islandton. A maximum sustained wind of 36 mph and gust of 51 mph occurred at the Lowcountry Regional Airport in Walterboro during this event.
- September 4, 2019: Colleton County Emergency Management reported several trees down across the entire county due to strong winds associated with Hurricane Dorian. The RAWS site in the ACE Basin near the Colleton County and Charleston County line measured a peak wind gust of 60 mph.

Town of Edisto Beach

- Between 2012-2019, the town has experienced major hurricane including Hurricane Jaoquin in 2015, Hurricane Matthew in 2016, Hurricane Irma in 2017, Hurricane Florence in 2018, and Hurricane Dorian in 2019. Total reported damage from these hurricane events were $4,917,071.

City of Walterboro and Towns of Cottageville, Lodge, Smoaks, and Williams

- Between 2012-2019, the city and towns have experienced hurricanes and tropical storms with little to no damage.

Hampton County

Between 2012-2019, there were eight hurricanes and tropical storms that have affected the county with light damage. The following are the notable events.

- June 7, 2013: A Tropical Storm Andrea passes over the area bringing periods of heavy rain and damaging wind gusts. The South Carolina Department of Highways reported a tree down in many areas - Pond Town Road and Prince William Road.
- September 2, 2016: Hampton County Emergency Management reported scattered trees blown down due to the passage of Tropical Storm Hermine.
- October 8, 2016: There was a report on numerous trees down along Highway 119 near the 321 Junction during Hurricane Matthew.

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- Between 2012-2019, all towns have experienced hurricanes and tropical storms with little to no damage.

Jasper County

Between 2012-2019, there were eight hurricanes and tropical storms that have affected the county with light damage. The following are the notable events.

- May 27, 2012: A Tropical Storm Beryl slowly moved to the area producing tropical storm force winds, rip currents, and areas of heavy rainfall. The trees down were reported on Deerfield Road and Old House Road.
- September 11, 2017: Jasper County Emergency Management reported multiple trees down across the county due to strong winds associated with Hurricane Irma.
- October 10, 2018: A strong wind associated with Hurricane Michael blew down a tree down near Ridgeland.
- September 4, 2019: Jasper County Emergency Management reported several trees down across the entire county due to strong winds associated with Hurricane Dorian.

City of Hardeeville and Town of Ridgeland

- June 6, 2013: A Tropical Storm Andrea occurred with showers and thunderstorms causing a tree down along Interstate 95 near mile marker 10, on John Smith Road, and on Highway 17 between Hardeeville and Ridgeland.
- October 8, 2016: The Jasper County 911 Call Center reported Interstate 95 closed between Ridgeland and Hardeeville due to many trees down on the road as well as water covering the road surface near exit 22 during Hurricane Matthew.

Future Probability

Table 14 shows that the future probability of hurricanes and tropical storms is relatively high in the Lowcountry region, with high consequences based on damages (see Loss Information Section).

Table 14: Hurricane and Tropical Storms Historical and Recent Hazards Events 1988-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**28**	**32**	**0.9**	**1.14**	**88%**	**8**
City of Beaufort	28	32	0.9	1.14	88%	8
Town of Bluffton	28	32	0.9	1.14	88%	8
Town of Hilton Head Island	28	32	0.9	1.14	88%	8
Town of Port Royal	28	32	0.9	1.14	88%	8
Colleton County	**28**	**32**	**0.9**	**1.14**	**88%**	**8**
Town of Cottageville	28	32	0.9	1.14	88%	8
Town of Edisto Beach	28	32	0.9	1.14	88%	8
Town of Lodge	28	32	0.9	1.14	88%	8
Town of Smoaks	28	32	0.9	1.14	88%	8
City of Walterboro	28	32	0.9	1.14	88%	8
Town of Williams	28	32	0.9	1.14	88%	8
Hampton County	**28**	**32**	**0.9**	**1.14**	**88%**	**8**
Town of Brunson	28	32	0.9	1.14	88%	8
Town of Estill	28	32	0.9	1.14	88%	8
Town of Furman	28	32	0.9	1.14	88%	8
Town of Gifford	28	32	0.9	1.14	88%	8
Town of Hampton	28	32	0.9	1.14	88%	8
Town of Luray	28	32	0.9	1.14	88%	8
Town of Scotia	28	32	0.9	1.14	88%	8
Town of Varnville	28	32	0.9	1.14	88%	8
Town of Yemassee	28	32	0.9	1.14	88%	8
Jasper County	**28**	**32**	**0.9**	**1.14**	**88%**	**8**
City of Hardeeville	28	32	0.9	1.14	88%	8
Town of Ridgeland	28	32	0.9	1.14	88%	8

Source: Hazards and Vulnerability Research Institute (HVRI) and NOAA's International Best Track Archive for Climate Stewardship (IBTrACS)

3.4 WINDSTORM

Characteristics and Classification

There are two different types of wind hazards, strong winds and Thunderstorms winds. *Strong winds* are non-convective winds gusting less than 58 mph. *Thunderstorm winds* are winds associated with convective storms that produce lightning within 30 minutes of the wind gusts (NWS, 2016). These gusts can reach 80 mph in the Lowcountry, and can fell trees, damage structures, and topple powerlines. Although lightning is an integral feature of thunderstorm winds, the perils associated with lightning are in a separate section of this report.

According to Storm Prediction Center (SPC) (2018), thunderstorms occur when air rises quickly, creates clouds which then generates precipitation. Straight-line thunderstorm winds typically occur with descending air pushed down by the precipitation of the storm in the downdraft, although winds associated with the updraft can occasionally cause minor damage. There are a few types of thunderstorms, but the straight-line winds associated with them generally are inflow winds, downbursts, the gust front, and the rear flank downdraft.

Thunderstorm wind events are defined as winds occurring within 30 minutes of lightning. Winds and wind gusts of any speed also are recorded if they cause damage or produce injuries or fatalities and whether they are produced by convection or not. Maximum sustained winds over 58 mph are recorded regardless of any associated loss. Non-convective strong wind gusts less than 40 mph resulting in damage, injury, or a fatality are recorded (NWS, 2016).

Types of Wind

- *Inflow winds:* coming from the air being pulled up into the storm. These are usually negligible, but they can cause minor damage.
- *A downburst:* occurring when the wind reaching the surface for the first time is strong enough to cause damage.
- *The gust front:* representing winds that are being pushed along the ground ahead of the storm.
- *A rear flank downdraft:* occurring when a storm with a rotating updraft pulls the downdrafts to the side and behind the storm. These can reach speeds of up to 70 mph.
- *The derecho:* a widespread, long lived, and damaging thunderstorm. The storm's wind damage swath must extend more than 240 miles with wind gusts exceeding 57 mph along most of the length of the storm's path.

Location and Extent

According to the National Weather Service (n.d.-a), there is a system of estimating and reporting wind strengths called "Beaufort Wind Scale", one of the first scales to estimate wind speeds and the effects on land or at sea. The scale starts with 0 and goes to a force of 12 as shown in the Table 15.

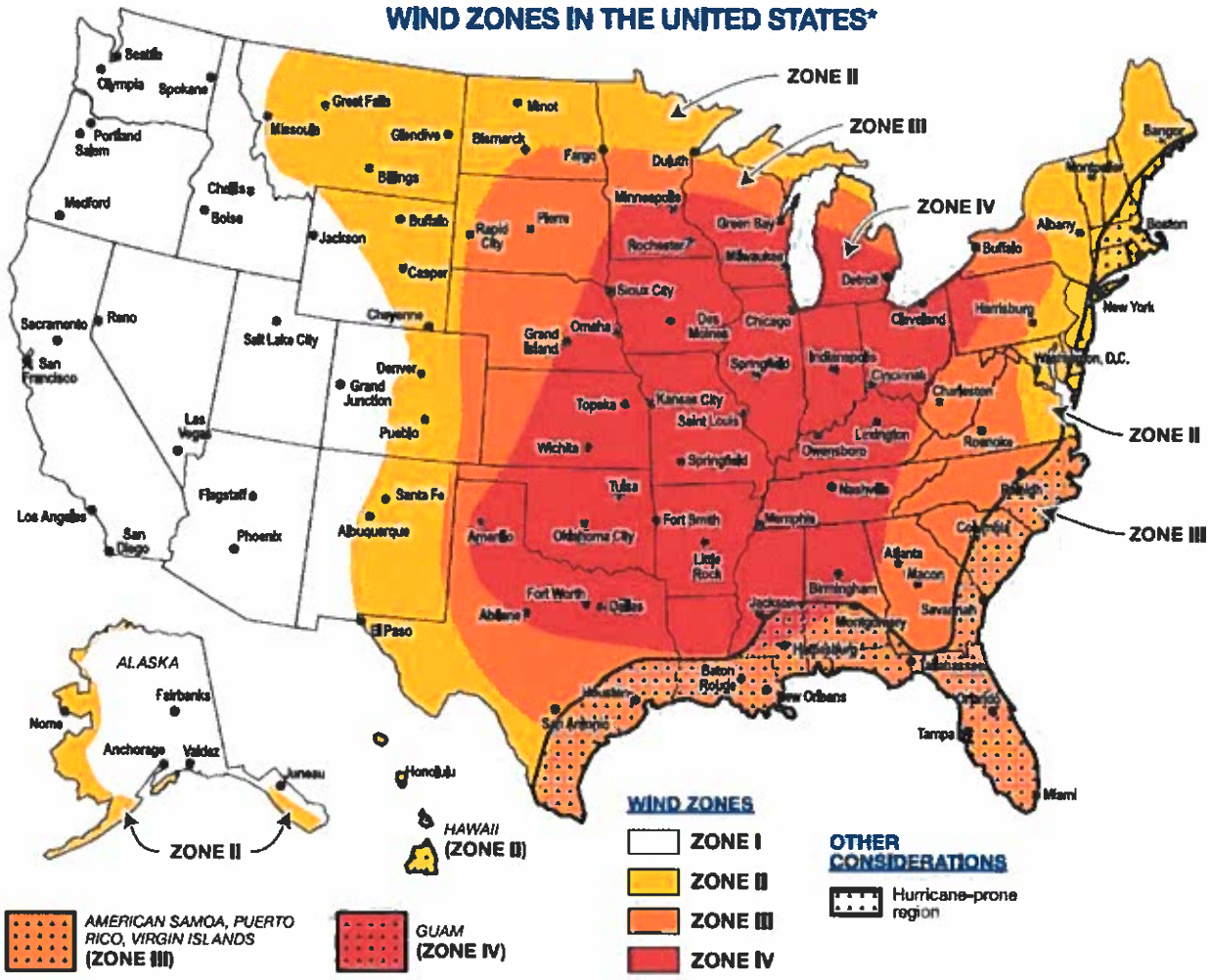
Table 15: Beaufort Wind Scale

Force	Wind Speed (mph)	Description	Wind Effects on Land	Wind Effects at Sea
0	0-1	Calm	Calm; smoke rises vertically.	Sea like a mirror.
1	1-3	Light Air	Direction of wind shown by smoke drift, but not by wind vanes.	Ripples with the appearance of scales are formed, but without foam crests.
2	4-7	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind.	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break.
3	8-12	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
4	13-18	Moderate Breeze	Raises dust and loose paper; small branches are moved.	Small waves, becoming larger; fairly frequent white horses.
5	19-24	Fresh Breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters.	Moderate waves, taking a more pronounced long form; many white horses are formed.
6	25-31	Strong Breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	Large waves begin to form; the white foam crests are more extensive everywhere.
7	32-38	Near Gale	Whole trees in motion; inconvenience felt when walking against the wind.	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
8	39-46	Gale	Breaks twigs off trees; generally impedes progress.	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.
9	47-54	Severe Gale	Slight structural damage occurs (chimney-pots and slates removed).	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility.
10	55-63	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The tumbling of the sea becomes heavy and shock-like. Visibility affected.
11	64-72	Violent Storm	Very rarely experienced; accompanied by wide-spread damage.	Exceptionally high waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.
12	72 and Over	Hurricane	See Saffir-Simpson Hurricane Scale.	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.

Source: National Weather Service (NWS)

Thunderstorm winds including strong winds are frequent occurrences in the Lowcountry region which is located within Wind Zone III as shown in Figure 16 (FEMA. 2014). There are over 2,000 wind events in the Lowcountry counties, with over half of these creating some type of damage or a human injury.

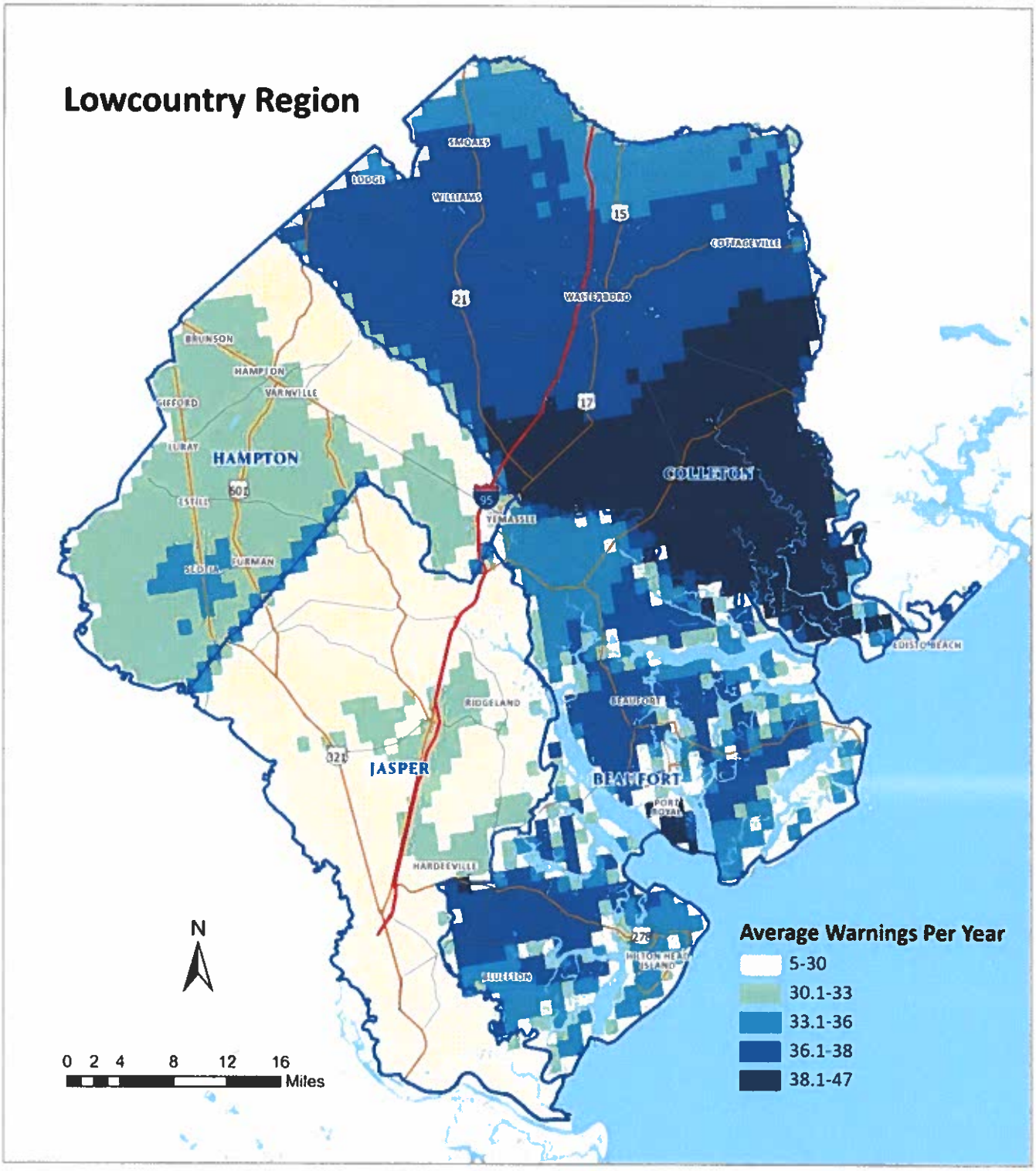
Figure 16: Wind Zones in the United States



Source: FEMA (2014)

The majority of the wind events occurred in Colleton County. As depicted in Figure 17, the issuance of severe storm warnings for thunderstorm winds and strong winds shows the higher concentration in Colleton County and is a useful measure of the prevalence of this hazard.

Figure 17: Severe Thunderstorm and Strong Wind Warnings 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI), NOAA National Weather Service, Iowa Environmental Mesonet

Beaufort County

Beaufort Colleton has experienced 148 windstorms between 2012-2019 with approximately $260,000 in damage and two injuries. There have been several recent events worth noting in the county.

- July 1, 2012: Thunderstorm winds gusting up to 75 mph swept across the county, bringing down large amounts of trees and powerlines. Power was not fully restored for a few days.
- June 17, 2016: Thunderstorm winds gusting up to 75 mph brought down trees and powerlines across the county. The $50,000 property damage was reported in the Town of Hilton Head and also a large tree fell and injured two people.

City of Beaufort and Towns of Bluffton, Hilton Head Island, and Port Royal

- Between 2012-2019, the city and towns have experienced windstorms with little to no damage.

Colleton County

Colleton County has experienced 244 windstorms between 2012-2019. A Colleton County emergency manager reported several trees down throughout the county. These windstorms caused approximately $170,000 in total property damage, and one death and no injuries. Notable events include:

- December 21, 2012: A strong cold front swept through the county during the evening and overnight hours. There was a report of a tree down along Palmetto Boulevard on Edisto Beach.
- April 9, 2019: Very strong low to mid-level wind fields and ample forcing contributed to the development of a strong squall line of thunderstorms, which produced widespread damaging winds. Numerous trees down were reported in Hendersonville. Also, the Colleton County fire and rescue reported trees and power lines down at the recreation center near the Walterboro Airport. The property damage totaled $17,500.

City of Walterboro and Towns of Cottageville, Edisto Beach, Smoaks, and Williams

- Between 2012-2019, these jurisdictions have experienced windstorms with little to no damage.

Town of Lodge

- Between 2012-2019, there was no notable windstorm events.

Hampton County

Between 2012-2019, Hampton County has experienced 103 windstorms with $879,535 in financial loss, and no deaths or injuries. Notable events include:

- July 1, 2012: Thunderstorms fired along an inland surface trough axis, multicell thunderstorms then generated cold pools which drove severe convection through the entire county. Trees and powerlines were down countywide. More than 1,000 people were without power through July 2, 2012.
- June 6, 2018: Thunderstorm winds gusting up to an estimated 81 mph caused the collapse of the roof on a furniture store in the county. Five people were rescued from the building but were otherwise unharmed. Some other buildings sustained light damage.

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- Between 2012-2019, the towns have experienced windstorms with little to no damage.

Jasper County

Between 2012-2019, Jasper County has experienced 156 windstorms with $129,461 in financial loss, and no deaths or injuries. Notable events include:

- June 11, 2012: Beginning in Switzerland, strong winds developed in associated with the strong pressure gradient and the presence of a strong low-level jet. A spotter reported a tree down and on a power line on Jasper Road. Numerous trees were also uprooted or snapped off in the woods on both sides of the road. The total damage was $30,000.

City of Hardeeville

- June 22, 2019: A strong to severe thunderstorm developed across the county. The Department of Highways reported power lines down at the intersection of Main Street and Epps Avenue in the City of Hardeeville.

Town of Ridgeland

- July 1, 2012: Thunderstorms generating cold pools through the entire county. It was estimated 10 to 15 trees and power lines down in the Town of Ridgeland.

Future Probability

In comparison with other hazards, thunderstorm winds and strong winds are high frequency events (see Table 16). They have more than 100% chance of occurring in any given year and they recur almost monthly, but with lower consequences based on damages (see Loss Information Section). Less than half of the recorded thunderstorm wind/strong wind events caused any crop or property damage, nor did they result in any human casualty (death or injury).

Table 16: Severe Thunderstorms and Windstorms Historical and Recent Hazards Events 1996-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**268**	**24**	**11.2**	**0.09**	**1,117%**	**148**
City of Beaufort	59	24	2.5	0.41	246%	15
Town of Bluffton	40	24	1.7	0.60	167%	9
Town of Hilton Head Island	38	24	1.6	0.63	158%	17
Town of Port Royal	9	24	0.4	2.67	38%	4
Colleton County	**440**	**24**	**18.3**	**0.05**	**1,833%**	**244**
Town of Cottageville	52	24	2.2	0.46	217%	26
Town of Edisto Beach	5	24	0.2	4.80	21%	0
Town of Lodge	5	24	0.2	4.80	21%	0
Town of Smoaks	18	24	0.8	1.33	75%	8
City of Walterboro	91	24	3.8	0.26	379%	35
Town of Williams	11	24	0.5	2.18	46%	4
Hampton County	**196**	**24**	**8.2**	**0.12**	**817%**	**103**
Town of Brunson	11	24	0.5	2.18	46%	3
Town of Estill	24	24	1.0	1.00	100%	12
Town of Furman	14	24	0.6	1.71	58%	9
Town of Gifford	11	24	0.5	2.18	46%	6
Town of Hampton	41	24	1.7	0.59	171%	15
Town of Luray	6	24	0.3	4.00	25%	1
Town of Scotia	4	24	0.2	6.00	17%	4
Town of Varnville	19	24	0.8	1.26	79%	8
Town of Yemassee	9	24	0.4	2.67	38%	3
Jasper County	**262**	**24**	**10.9**	**0.09**	**1,092%**	**156**
City of Hardeeville	35	24	1.5	0.69	146%	21
Town of Ridgeland	35	24	1.5	0.69	146%	9

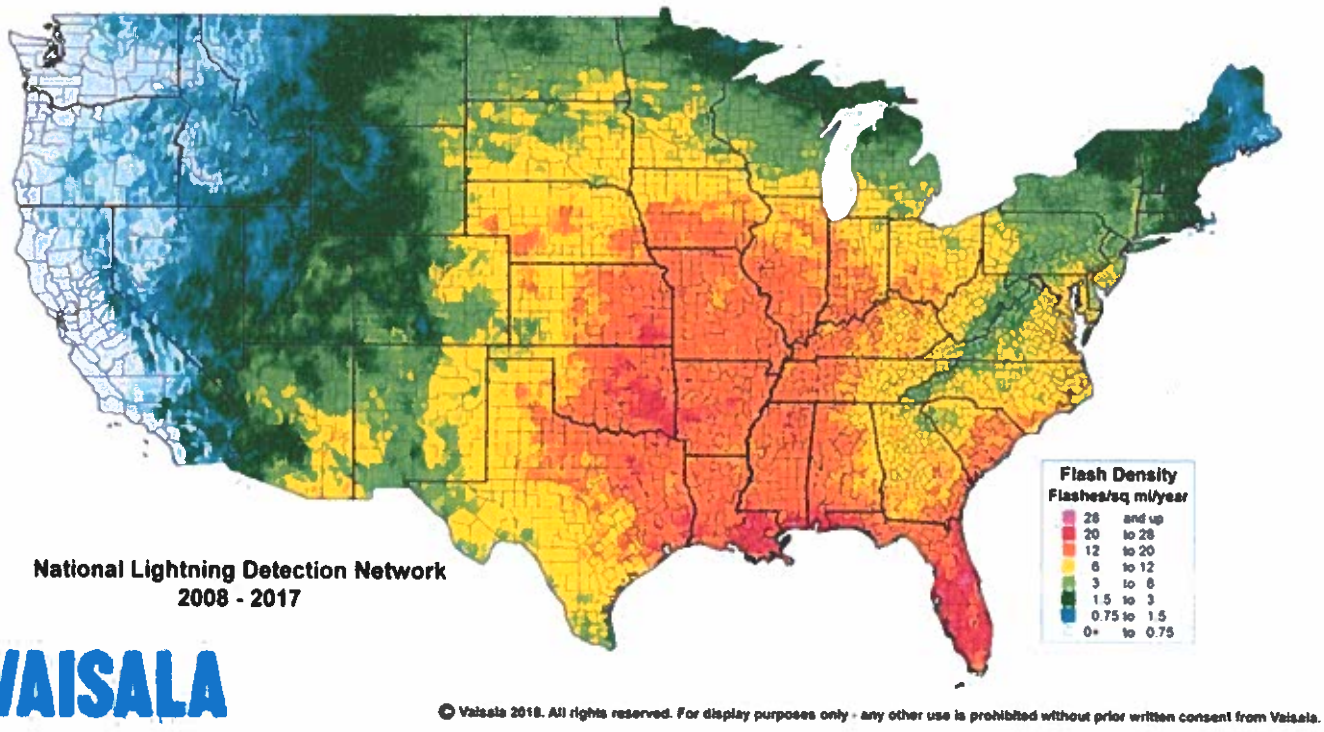
Source: Hazards and Vulnerability Research Institute (HVRI) and NOAA's Storm Events database

3.5 LIGHTNING

Characteristics and Classification

Lightning is an electrical discharge that results in a giant spark between two clouds, or cloud and the ground. Although lightning is associated with severe storms, lightning strikes have been recorded 25 miles away from the storm cloud. It takes five seconds for thunder to travel one mile, so for every five seconds the sound is removed from the flash equals one mile between you and the flash (NWS, 2020b). Figure 18 shows the lightning density across the nation.

Figure 18: National Cloud-to-Ground Lightning Incidence



Source: National Lightning Detection Network (NLDN)

The primary hazards associated with lightning are structural damages to buildings and potential fire. There are also electrocution hazards to people from lightning strikes resulting in injuries or deaths especially when outdoors in unsheltered areas such as golf courses or on the water.

Location and Extent

The extent for lightning can be expressed in terms of the number of strikes in a period. The National Weather Service (NWS) uses "Lightning Activity Level (LAL)" on a scale from 1 to 6 to rate the cloud-to-ground lightning strikes observed in an area during the rating period as shown in Table 17 (NWS, n.d.-b). Also the LAL is used by the National Wildfire Coordinating Group (NWCG) when forecasting a high potential for fire ignition (NWCG, 2002).

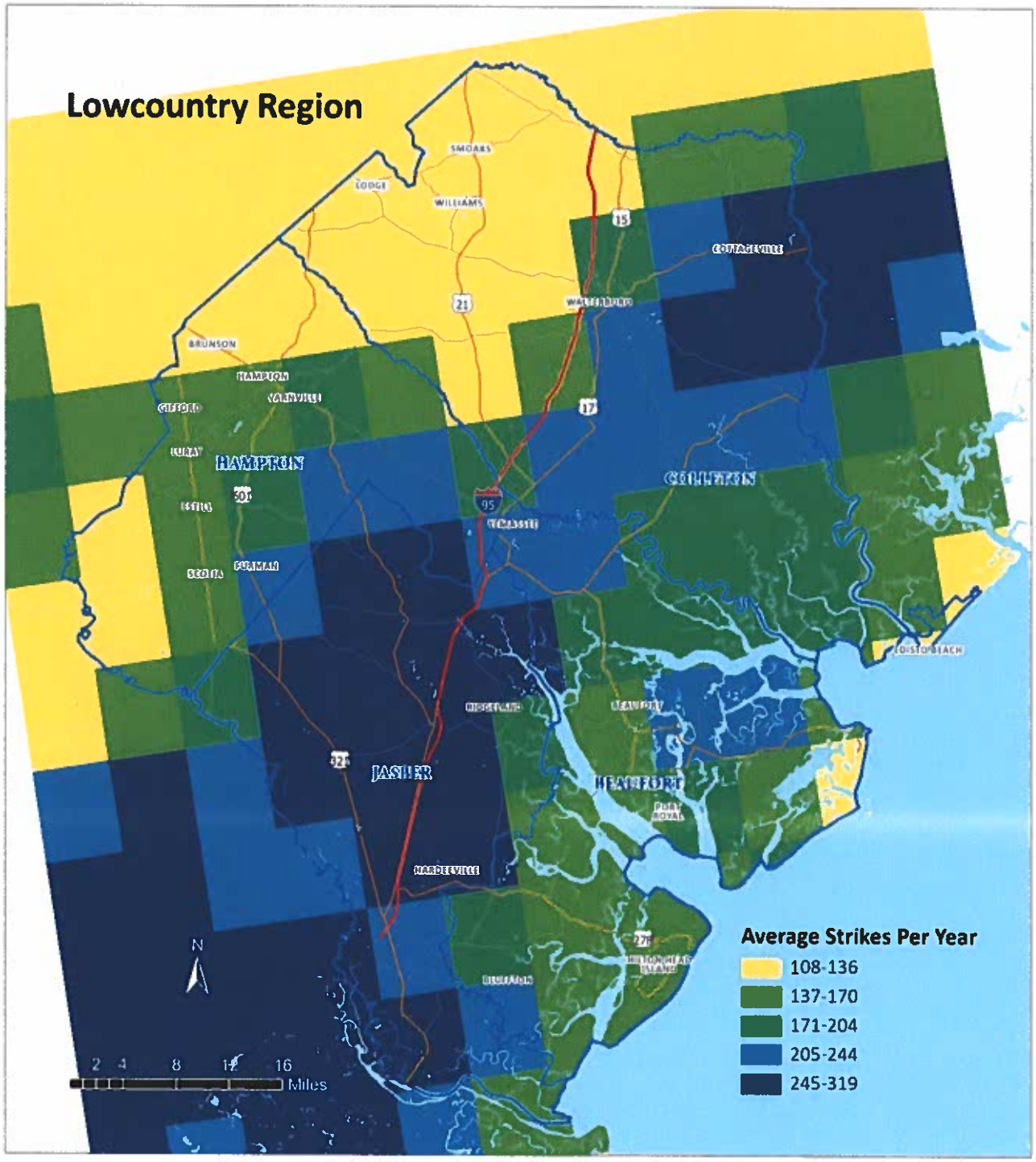
Table 17: Lightning Activity Level (LAL)

Level	Description
1	No thunderstorms or building cumulus clouds observed.
2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1-5 cloud-to-ground strikes in a five-minute period.
3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6-10 cloud-to-ground strikes in a five-minute period.
4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11-15 cloud-to-ground strikes in a 5-minute period.
5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a five-minute period.
6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for starting fires, and is normally highlighted in fire weather forecasts with a red flag warning.

Source: National Weather Service (NWS) and National Wildfire Coordinating Group (NWCG)

Lightning strikes in the Lowcountry recorded by the National Lightning Detection Network starting in 1999 number over 330,000. The majority of these (36%) were in Colleton County. When looking at yearly averages, there is also a concentration or hotspot of lightning strikes in Jasper County (Figure 19).

Figure 19: Average Lightning Strikes per Year 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI); National Lightning Detection Network (NLDN)

Beaufort County

While there have been numerous lightning strikes and events within the county between 2012-2019, there has only been one notable strike on August 19, 2018, southeast of Marine Corps Air Station (MCAS), City of Beaufort. The following are some notable events.

- July 25, 2014: Scattered thunderstorms developed in the afternoon hours and produced numerous lightning strikes. Beaufort County emergency manager reported several structure fires on Newpoint Road, Flycatcher Lane, and Dore Drive due to a lightning strike.
- June 25, 2015: Numerous showers and thunderstorms developed after midnight producing damaging wind gusts. There was a report on a house that was struck by lightning. It hit the rear of the home and flames eventually came through the roof. The damage was approximately $10,000.

City of Beaufort

- August 19, 2018: The lightning even occurred southeast of Marine Corps Air Station (MCAS), City of Beaufort which resulted in $1.7million worth of property damage. None have resulted in fatalities, injuries, or crop damage. The Island Packet Newspaper reported a house in the Pleasant Point neighborhood was struck by lightning and burned to the ground.

Town of Bluffton

- June 9, 2015: A structure fire caused by lightning in the 20-block area of Ironwood Circle was reported.
- July 8, 2017: A suspected lightning strike resulted in a building fire off of Burnt Church Road resulting in $5,000 damage.

Town of Port Royal

- July 5, 2019: Scattered to numerous thunderstorms developed and produced damaging wind gusts as well as numerous cloud- to-ground lightning strikes. A building on Richmond Avenue was struck by lightning with little damage of $1,000.
- August 17, 2019: Moisture convergence along a weak trough of low pressure and building instability during the afternoon led to several thunderstorms across the area. A home was struck by lightning. The extent of damage was minor, but one individual was displaced.

Colleton County

Between 2012-2019, numerous lightning strikes have occurred through the entire county resulting in $108,268 property damage, and no deaths or injuries. Notable events include:

- April 5, 2017: The event occurred in Hendersonville. Lightning struck a large oak tree which resulted in a fire that destroyed a 30x50 foot workshop, tools, and moderate size utility tractor. The damage totaled $40,000.
- August 6, 2018: The media relayed a report of a double-wide mobile home catching fire and burning to the ground due to lightning striking the roof causing $68,000 in damage.

City of Walterboro and Towns of Cottageville, Edisto Beach, Lodge, Smoaks, and Williams

- All municipalities in Colleton County have experienced lightning strikes with little to no damage.

Hampton County

There have been numerous lightning strikes in Hampton County between 2012-2019 with no financial loss, and no deaths or injuries.

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- There have been numerous lightning strikes in these towns between 2012-2019 with no financial loss, and no deaths or injuries.

Jasper County

There have been numerous lightning strikes in Jasper County between 2012-2019 with light damage, and two injuries or no deaths.

City of Hardeeville and Town of Ridgeland

- There have been numerous lightning strikes in these jurisdictions between 2012-2019 with no financial loss, and no deaths or injuries.

Future Probability

Lightning is a frequent hazard that occurs multiple times per day or even per hour in strong thunderstorms as shown in Table 18. The recurrence frequency for lightning is less than 0.01 per year, but if converted to a daily frequency of occurrence, it would be roughly every 0.38 days.

Table 18: Lightning Historical and Recent Hazards Events 1999-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**20,166**	**21**	**960.3**	**<0.01**	**96,029%**	**32,481**
City of Beaufort	20,166	21	960.3	<0.01	96,029%	32,481
Town of Bluffton	20,166	21	960.3	<0.01	96,029%	32,481
Town of Hilton Head Island	20,166	21	960.3	<0.01	96,029%	32,481
Town of Port Royal	20,166	21	960.3	<0.01	96,029%	32,481
Colleton County	**34,597**	**21**	**1647.5**	**<0.01**	**164,748%**	**42,333**
Town of Cottageville	34,597	21	1647.5	<0.01	164,748%	42,333
Town of Edisto Beach	34,597	21	1647.5	<0.01	164,748%	42,333
Town of Lodge	34,597	21	1647.5	<0.01	164,748%	42,333
Town of Smoaks	34,597	21	1647.5	<0.01	164,748%	42,333
City of Walterboro	34,597	21	1647.5	<0.01	164,748%	42,333
Town of Williams	34,597	21	1647.5	<0.01	164,748%	42,333
Hampton County	**19,914**	**21**	**948.3**	**<0.01**	**94,829%**	**21,509**
Town of Brunson	19,914	21	948.3	<0.01	94,829%	21,509
Town of Estill	19,914	21	948.3	<0.01	94,829%	21,509
Town of Furman	19,914	21	948.3	<0.01	94,829%	21,509
Town of Gifford	19,914	21	948.3	<0.01	94,829%	21,509
Town of Hampton	19,914	21	948.3	<0.01	94,829%	21,509
Town of Luray	19,914	21	948.3	<0.01	94,829%	21,509
Town of Scotia	19,914	21	948.3	<0.01	94,829%	21,509
Town of Varnville	19,914	21	948.3	<0.01	94,829%	21,509
Town of Yemassee	19,914	21	948.3	<0.01	94,829%	21,509
Jasper County	**27,595**	**21**	**1314.0**	**<0.01**	**131,405%**	**33,241**
City of Hardeeville	27,595	21	1314.0	<0.01	131,405%	33,241
Town of Ridgeland	27,595	21	1314.0	<0.01	131,405%	33,241

Source: Hazards and Vulnerability Research Institute (HVRI) and National Centers for Environmental Information

3.6 HAIL

Characteristics and Classification

Hail is the frozen precipitation from convective thunderstorms. Any thunderstorm with the right conditions can spawn hail, meaning hail can occur anywhere. Hail in the Lowcountry has ranged from the size of a pea (a quarter of an inch), to the size of a large apple (three inches). Hail can damage cars, buildings, ruin crops, and cause bodily harm to people and livestock caught outside without any protection. Hail is the result of the water droplets moving through the atmosphere where temperatures can reach lower than -40°F, quickly freezing the droplets. As the frozen droplets continue the updraft and downdraft motion within the storm and any additional liquid water that it collides with can freeze and grow the size of the hail. When the hail has grown too big for the winds to keep in the air, it will fall to the ground. Larger hailstone will fall faster, with teacup-sized hail falling between 44 and 72 mph, and thus doing more damage (NSSL, 2020b).

Location and Extent

Hail is described using known objects to estimate the size of the hail (Table 19). The larger the hail size the more damage produced (NWS, 2020c). Hail ranging from the size of golf balls to baseballs damaged 62 planes and numerous cars on Hilton Head Island on March 15, 2008. Roughly ten percent of the planes were total losses and an additional 25% were no longer air worthy. The associated damages totaled $1.17 million. More recently, on August 2, 2012 hail ranging from the size of golf balls to baseballs (~2.75 in) fell in Colleton County near the intersection of SC-17 and SC-303 (NCEI, 2020b).

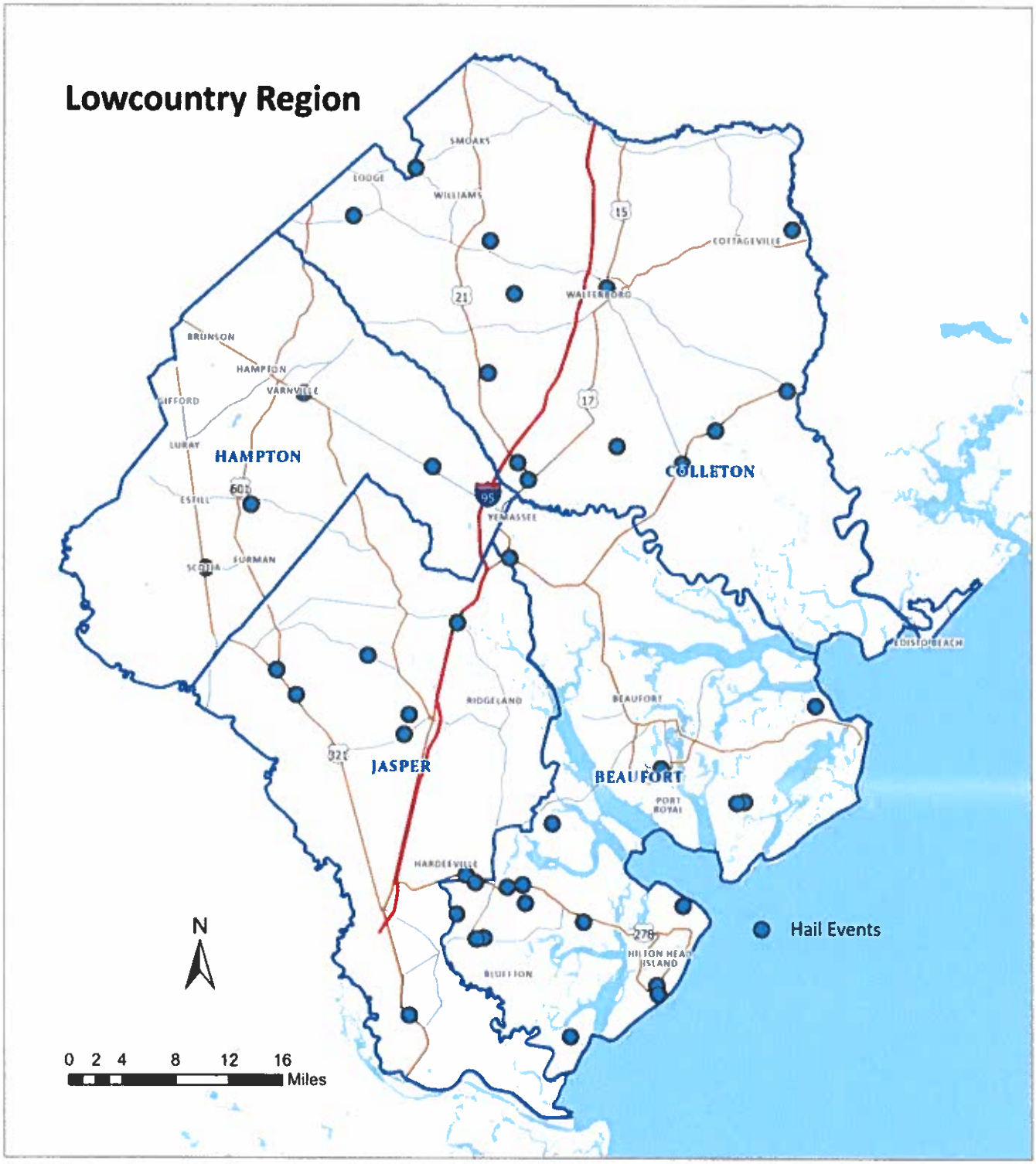
A total of 45 hail events have been recorded from 2012-2019. There were no deaths or damages associated with these events. The location of hail events shows a random pattern throughout the region (Figure 20). A small hot spot of hail events appears in eastern section of Beaufort County near the Jasper county line.

Table 19: Estimations of Hail Diameters

Known Object	Estimated Diameter (inches)
Pea	1/4
Marble	1/2
Dime/Penny	3/4
Nickel	7/8
Quarter	1
Ping-Pong Ball	1 1/2
Golf Ball	1 3/4
Lime	2
Tennis Ball	2 1/2
Baseball	2 3/4
Large Apple	3
Softball	4
Grapefruit	4 1/2

Source: National Weather Service (NWS)

Figure 20: Geographic Distribution of Recent Hail Events 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Beaufort County

Between 2012-2019, the county has experienced 20 significant storms that have produced hail. There have been no reported damage, injuries, or fatalities. Example of events are the following:

- August 16, 2012: Thunderstorms developed in the afternoon hours with numerous reports of nickel to quarter sized hail in the Town of Bluffton and Pritchardville. The hail fell for five minutes.

Town of Hilton Head Island

- April 25, 2015: Strong instability and a strongly sheared environment set up favorable conditions for hail in the town of Hilton Head Island. The public reported penny size hail on the northern end of the Island.

City of Beaufort and Towns of Bluffton and Port Royal

- There was no record of hail events in the city and town.

Colleton County

Fifteen hail events have occurred in Colleton County. There have been no reported damage, injuries, or deaths. Example of events are the following.

- August 2, 2012: Thunderstorms produced scattered wind damage and multiple instances of large hail. The public reported golf ball to baseball sized hail near the intersection of Highway 17 and Highway 303 in Green Pond.
- July 21, 2016: Isolated to scattered thunderstorms developed in the afternoon hours across portions of southeast South Carolina. A couple of these storms became strong enough to produce damaging wind gusts and large hail. A trained spotter reported hail that ranged from quarter sized to golf ball sized, covering a porch.

City of Walterboro

- September 3, 2013: Several thunderstorms along with low temperature produced hail in the county. The media reported quarter size hail near the Hampton Street Theatre in the City of Walterboro.

Town of Cottageville

- September 30, 2019: Thunderstorms developed ahead of a weak backdoor cold front and became strong enough to produce large hail and damaging wind gusts. A trained spotter reported pea to quarter sized hail in the Town of Cottageville.

Towns of Edisto Beach, Lodge, Smoaks, and Williams

- There was no record of hail events in these towns.

Hampton County

Between 2012-2019, there have been three hail events in Hampton County with no reported damage, injuries, or deaths. Some events include:

- August 14, 2013: Scattered to numerous showers and thunderstorms developed in the afternoon, with a few producing large hail and damaging wind gusts. The Hampton County Emergency Manager relayed a report of one-inch hail in Early Branch.

Town of Scotia

- March 18, 2013: A Severe Thunderstorm was monitored around 7:30 pm for the area. It maintained its strength and intensified at times as it entered the county. Quarter-sized hail was reported in the Town of Scotia.

Town of Varnville

- April 29, 2013: Numerous thunderstorms formed in the afternoon due to a sea breeze and a mid-level disturbance that moved in the area. Three-quarter-inch hail in Varnville were reported.

Town of Yemassee

- April 29, 2013: Numerous thunderstorms formed in the afternoon due to a sea breeze and a mid-level disturbance that moved in the area. One-inch hail in Pocotaligo was reported.

Towns of Brunson, Estill, Furman, Gifford, Hampton, and Luray

- There was no record of hail events in these towns.

Jasper County

Seven hail events have occurred in Jasper County between 2012-2019. There have been no reported damage, injuries, or deaths. Example of events are the following.

- March 16, 2012: Thunderstorms developed along inland surface boundaries and pushed toward the coast. Public reported penny sized hail at the Jasper County Recycling Center.
- June 25, 2018: Numerous strong to severe thunderstorms across the region produced dime to penny size hail. Hail caused small tree limbs to come down across the county.

City of Hardeeville

- April 29, 2013: Numerous thunderstorms formed in the afternoon due to a sea breeze and a mid-level disturbance that moved in the area. One-inch hail was reported on New River Parkway in Hardeeville.

Town of Ridgeland

- May 15, 2012: There were development of numerous showers and thunderstorms across the area during the mid-late afternoon. An observer reported penny-sized hail near the Town of Ridgeland.

Future Probability

In comparison with other hazards, hail is a high frequency event (see Table 20). It has more than 100% chance of occurring in any given year, but with lower consequences based on damages (see Loss Information Section).

Table 20: Hail Historical and Recent Hazards Events 1989-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**67**	**31**	**2.2**	**0.46**	**216%**	**20**
City of Beaufort	19	31	0.6	1.63	61%	0
Town of Bluffton	25	31	0.8	1.24	81%	3
Town of Hilton Head Island	20	31	0.6	1.55	65%	1
Town of Port Royal	5	31	0.2	6.20	16%	0
Colleton County	**73**	**31**	**2.4**	**0.42**	**235%**	**15**
Town of Cottageville	16	31	0.5	1.94	52%	3
Town of Edisto Beach	3	31	0.1	10.33	10%	0
Town of Lodge	2	31	0.1	15.50	6%	0
Town of Smoaks	5	31	0.2	6.20	16%	0
City of Walterboro	34	31	1.1	0.91	110%	1
Town of Williams	3	31	0.1	10.33	10%	0
Hampton County	**31**	**31**	**1.0**	**1.00**	**100%**	**3**
Town of Brunson	5	31	0.2	6.20	16%	0
Town of Estill	2	31	0.1	15.50	6%	0
Town of Furman	1	31	0.0	31.00	3%	0
Town of Gifford	0	31	0.0	*	*	0
Town of Hampton	12	31	0.4	2.58	39%	0
Town of Luray	0	31	0.0	*	*	0
Town of Scotia	1	31	0.0	31.00	3%	1
Town of Varnville	4	31	0.1	7.75	13%	1
Town of Yemassee	4	31	0.1	7.75	13%	1
Jasper County	**33**	**31**	**1.1**	**0.94**	**106%**	**7**
City of Hardeeville	10	31	0.3	3.10	32%	1
Town of Ridgeland	10	31	0.3	3.10	32%	2

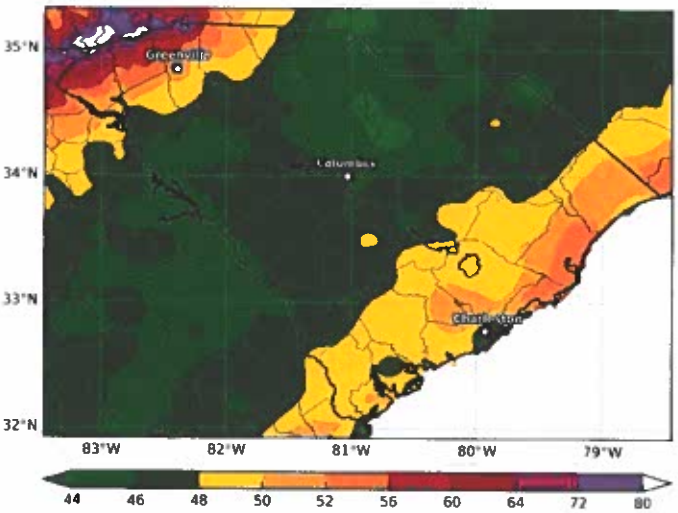
Note: Symbol (*) refers to "no value" because the hazard events have a value of zero.
Source: Hazards and Vulnerability Research Institute (HVRI) and NOAA's Storm Events database

3.7 DROUGHT

Characteristics and Classification

Drought occurs when a region receives lower-than-normal precipitation for a prolonged period. This deficit can affect agriculture, the economy, water levels, the environment, increase health problems, and increase wildfire risk. Droughts vary in severity based on the lack of precipitation, length of the event, and the area where it occurs. Droughts can occur at any time during the year, but historically the Fall is the driest season in South Carolina. The annual precipitation in the Lowcountry ranges between 46 and 56 inches as shown in Figure 21, with the lower end of the range falling further inland. Droughts can last from months to years and are often tied to long-term pressure systems in the Atlantic or the El Niño–Southern Oscillation (ENSO). This multi-year cycle originates in the Pacific Ocean but has widespread consequences reaching South Carolina.

Figure 21: SC Average Annual Precipitation (inches)



Source: Southeast Regional Climate Center (Map Credit: Jordan McLeod)

The state is wetter during the El Niño phase, and drier during La Niña (SC State Climate Office, 2020a). There are many factors that come together to classify a drought, including spatial extent, duration, and severity. The U.S. Drought Monitor uses these factors in their classifications and updates their drought designations on a weekly basis. Their drought classifications have five distinct categories and range from D0 (Abnormally Dry) to D4 (Exceptional Drought). South Carolina uses seven different indicators to measure drought status. These include the US Drought Monitor for South Carolina, crop moisture index, Palmer Drought severity index, streamflow levels, lake/reservoir levels, groundwater levels, and the Keetch-Byram drought index (SC State Climate Office, 2020b).

Location and Extent

Drought is a large-scale event that generally covers entire counties or regions rather than smaller geographic units. South Carolina's drought status at any given period is determined by the state's Drought Response Committee. Table 21 illustrates the drought status of Lowcountry counties from 2012-2020 as determined by the last SC Drought Response Committee meeting on January 30, 2020.

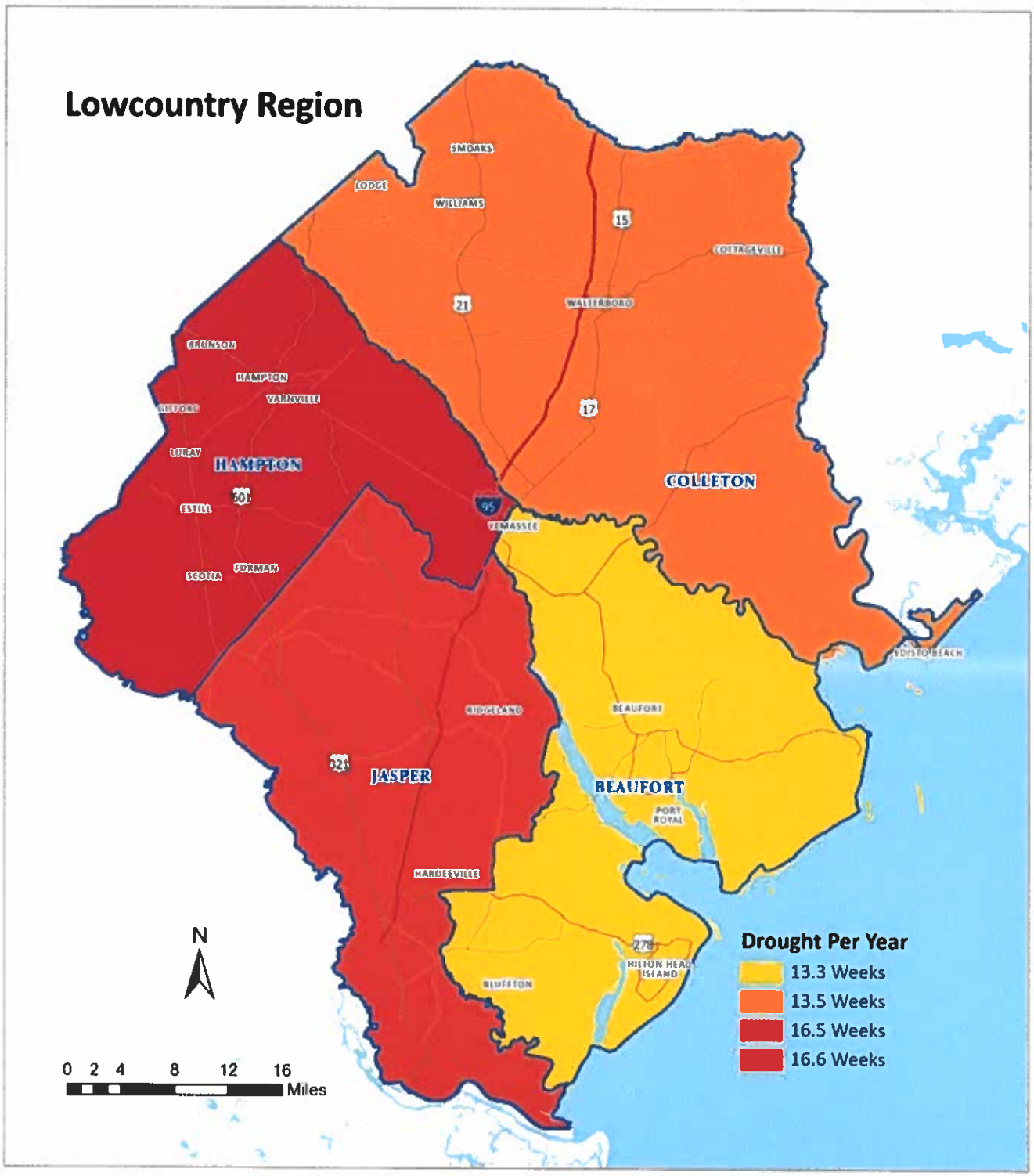
Table 21: Highest Drought Level Status 2012-2020

County	2012	2013	2014	2015	2016	2017	2018	2019	2020
Beaufort	Moderate	Moderate	Incipient	Incipient	Incipient	Normal	Normal	Moderate	Normal
Colleton	Moderate	Moderate	Incipient	Moderate	Incipient	Incipient	Incipient	Moderate	Normal
Hampton	Moderate	Moderate	Incipient	Moderate	Incipient	Incipient	Incipient	Moderate	Normal
Jasper	Moderate	Moderate	Incipient	Incipient	Incipient	Normal	Normal	Moderate	Normal

Source: SC State Climate Office

Another mechanism used to compare counties is the number of drought days the county experienced (Figure 22). Using the U.S. Drought Monitor for South Carolina, the Lowcountry experienced an average of 60 drought days during the past twenty years, but none of these conditions were severe.

Figure 22: Drought Frequency – Weeks of Drought per Year 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Beaufort County

Between 2012-2019, Beaufort County experienced an average of 13.3 drought weeks per year with no reported damage, and no deaths or injuries.

City of Beaufort and Towns of Bluffton, Hilton head Island, and Port Royal

- All municipalities in the county experienced the same drought weeks per year with no reported damage, and no deaths or injuries as well.

Colleton County

The county experienced an average of 13.5 drought weeks per year between 2012-2019. There has been no reported damage, and no deaths or injuries.

City of Walterboro and Towns of Cottageville, Edisto Beach, Lodge, Smoaks, and Williams

- All municipalities in the county experienced the same drought weeks per year with no reported damage, and no deaths or injuries as well.

Hampton County

Hampton County experienced an average of 16.6 drought weeks per year between 2012-2019. There has been no reported damage, and no deaths or injuries. However, there were significant impacts from the drought on farms in the county. Many dryland corn fields were reported to be beyond recovery. Concerns were also raised about poor pollination occurring due to the high heat in irrigated fields. Crops that were not in the reproductive phase were struggling and growing very slowly.

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- All municipalities in the county experienced the same drought weeks per year with no reported damage, and no deaths or injuries as well.

Jasper County

Between 2012-2019, Jasper County experienced an average of 16.5 drought weeks per year with no reported damage, and no deaths or injuries.

City of Hardeeville and Town of Ridgeland

- All municipalities in the county experienced the same drought weeks per year with no reported damage, and no deaths or injuries as well.

Future Probability

Table 22 shows that future drought events are very high with more than 1,000% chance of occurring in any given year. However, the consequences based on damages are low (see Loss Information Section).

Table 22: Drought Historical and Recent Hazards Events by Drought Week 2000-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**342**	**20**	**17.1**	**0.06**	**1,710%**	**107**
City of Beaufort	342	20	17.1	0.06	1,710%	107
Town of Bluffton	342	20	17.1	0.06	1,710%	107
Town of Hilton Head Island	342	20	17.1	0.06	1,710%	107
Town of Port Royal	342	20	17.1	0.06	1,710%	107
Colleton County	**352**	**20**	**17.6**	**0.06**	**1,760%**	**108**
Town of Cottageville	352	20	17.6	0.06	1,760%	108
Town of Edisto Beach	352	20	17.6	0.06	1,760%	108
Town of Lodge	352	20	17.6	0.06	1,760%	108
Town of Smoaks	352	20	17.6	0.06	1,760%	108
City of Walterboro	352	20	17.6	0.06	1,760%	108
Town of Williams	352	20	17.6	0.06	1,760%	108
Hampton County	**406**	**20**	**20.3**	**0.05**	**2,030%**	**133**
Town of Brunson	406	20	20.3	0.05	2,030%	133
Town of Estill	406	20	20.3	0.05	2,030%	133
Town of Furman	406	20	20.3	0.05	2,030%	133
Town of Gifford	406	20	20.3	0.05	2,030%	133
Town of Hampton	406	20	20.3	0.05	2,030%	133
Town of Luray	406	20	20.3	0.05	2,030%	133
Town of Scotia	406	20	20.3	0.05	2,030%	133
Town of Varnville	406	20	20.3	0.05	2,030%	133
Town of Yemassee	406	20	20.3	0.05	2,030%	133
Jasper County	**396**	**20**	**19.8**	**0.05**	**1,980%**	**132**
City of Hardeeville	396	20	19.8	0.05	1,980%	132
Town of Ridgeland	396	20	19.8	0.05	1,980%	132

Source: Hazards and Vulnerability Research Institute (HVRI)

3.8 EARTHQUAKE

Characteristics and Classification

Earthquakes typically occur near tectonic plate boundaries but can occur in the middle of plates. South Carolina is located in the interior of the North American plate and does not have an active plate boundary nearby. However, the energy released from the sudden displacement of rock in the Earth's crust can occur in weak spots along known faults and fault systems or inferred faults.

Earthquakes vary in magnitude and intensity. Two different scales are used to describe the physical force of the earthquake or the amount of energy released by measuring the amplitude of the shock waves.

- The Moment Magnitude scale is an instrument-based measurement of the physical force of the earthquake measured by the amplitude of the shock waves.
- The Modified Mercalli Intensity scale measuring the impacts that do not have a mathematical basis; instead, it is a ranking based on observed effects. According to U.S. Geological Survey (USGS) (2020a), the lower numbers of the intensity scale generally deal with the way the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage as shown in Table 23.

There are multiple effects associated with the release of energy waves from earthquakes, first *shaking the ground side to side and then up and down.* These waves can cause destruction on the surface from the shaking. After these primary effects, secondary effects are possible, and can be just as destructive in certain case. These secondary effects include:

- *Aftershocks:* Aftershocks are tremors that follow the original event and are often smaller. They can happen for weeks to years after the event. The larger the original event, the stronger the aftershocks can be and the longer they can persist.
- *Soil Liquefaction:* Liquefaction occurs when the movement of earth forces water into the soil around structures, making the very ground behave more like a liquid than a solid. This can cause the foundation of structures to sink or shift. The occurrence of liquefaction depends on several factors like soil type, soil saturation, and shaking characteristics.
- *Fires:* The movement of earth can cause gas line ruptures and can snap powerlines creating fire-prone environments. At the same time, waterlines might break making it more difficult to put out any fires occur (SCEMD, 2020b).
- *Landslides:* One of the triggers for landslide occurrence is earthquake. Landslides are mass movement of soil and might include rock falls that can cause significant damage.

Table 23: Earthquake Intensity Description

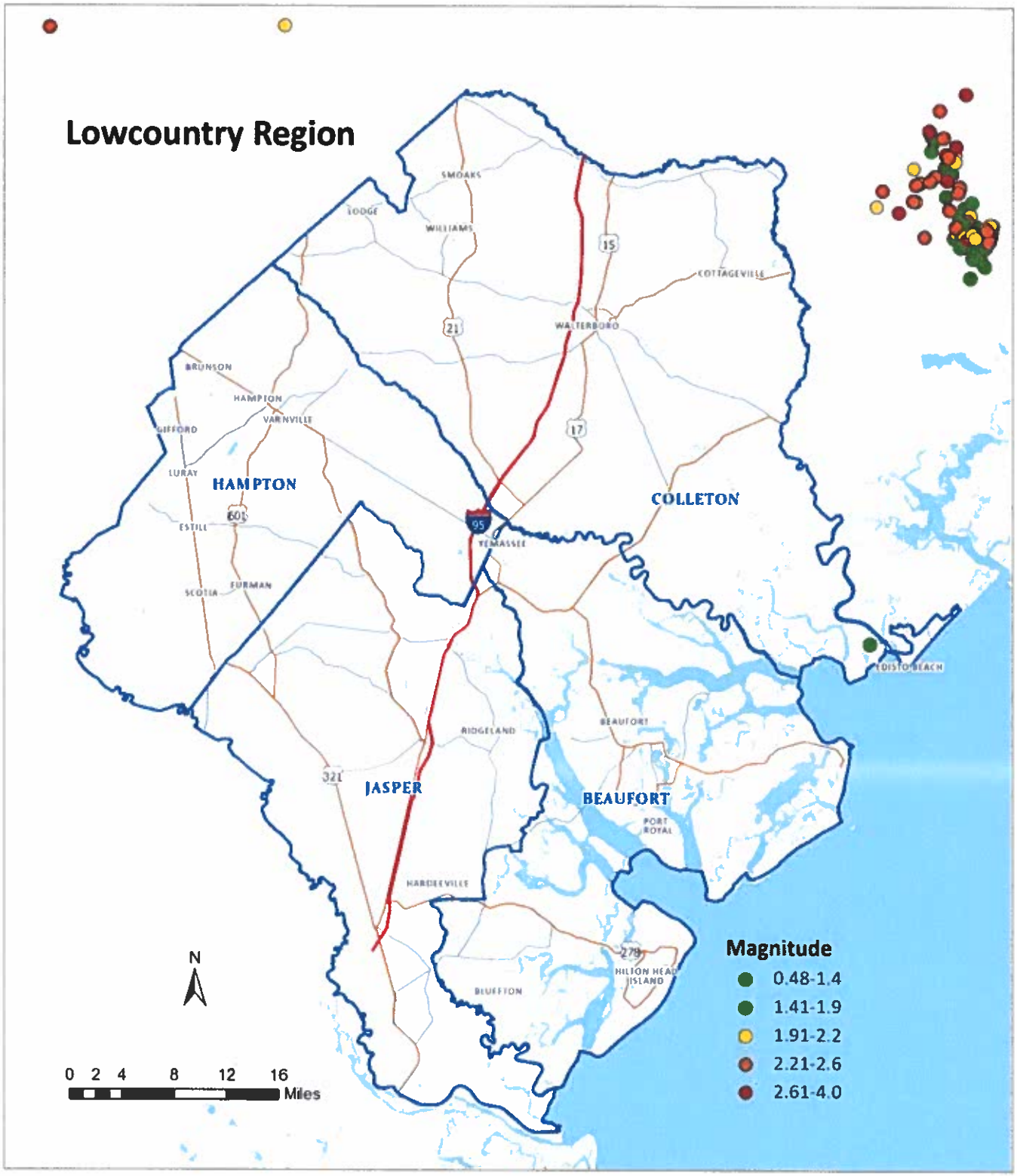
Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Note: Abbreviated description of the levels of modified Mercalli intensity.
Source: US Geological Survey (USGS)

Location and Extent

Earthquakes are low probability events in South Carolina and rarely felt. However, the August 31, 1886 Charleston Earthquake is notable because of its intensity (intensity X on the Modified Mercalli Scale). According to the State Hazard Mitigation Plan, earthquakes such as the 1886 Charleston event have a frequency of occurrence on the order of 400-500 years. Other evidence suggests that places near Bluffton may have occurrences in the range of every 2000 years (SCEMD 2018). Given evidence of prior large events in the Lowcountry, it appears that any given year has about a 1/400 chance of a large earthquake event. Figure 23 illustrates the earthquake events in the Lowcountry region and nearby area.

Figure 23: Recent Earthquakes near the Lowcountry Region 2000-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Beaufort County

There was no record of earthquake events in the recent period (2000-2019).

City of Beaufort and Towns of Bluffton, Hilton head Island, and Port Royal

- There was no record of earthquake events in the recent period (2000-2019).

Colleton County

There was no record of earthquake events in the recent period (2000-2019).

Town of Edisto Beach

- Between 2000-2019, the earthquake event occurred in the Town of Edisto Beach with 1.88 magnitude. No damage was reported.

City of Walterboro and Towns of Cottageville, Lodge, Smoaks, and Williams

- There was no record of earthquake events in the recent period (2000-2019).

Hampton County

There was no record of earthquake events in the recent period (2000-2019).

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- There was no record of earthquake events in the recent period (2000-2019).

Jasper County

There was no record of earthquake events in the recent period (2000-2019).

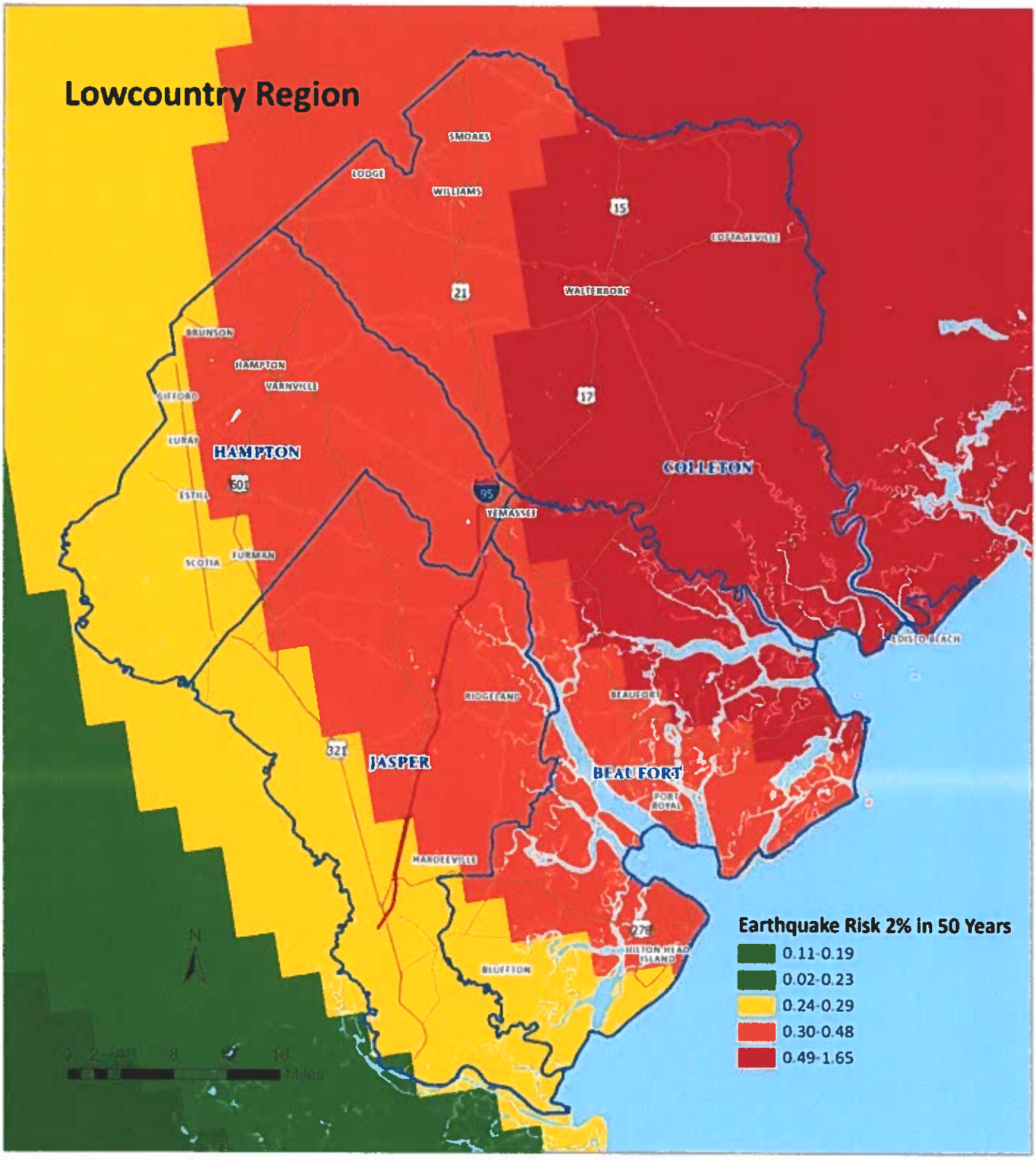
City of Hardeeville and Town of Ridgeland

- There was no record of earthquake events in the recent period (2000-2019).

Future Probability

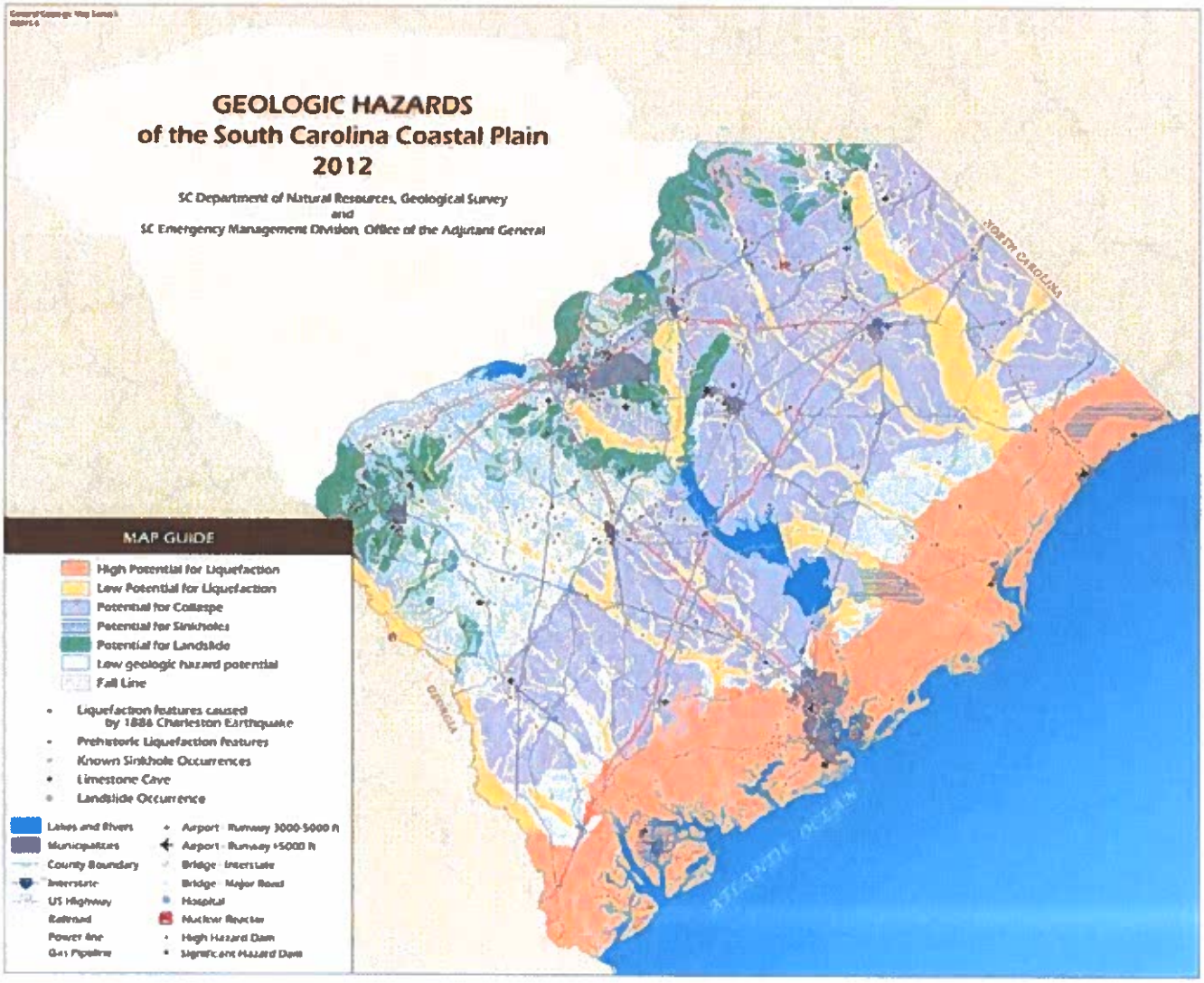
For the Lowcountry region, there is a potential for liquefaction and tsunami activity from localized earthquakes. The U.S. Geological Survey provides probability maps of potential earthquake risk. Potential earthquake risk using peak ground acceleration (PGA) shows the amount of ground motion expected with a 2% probability of being exceeded in 50 years. The highest hazard areas are color coded red, with the lowest hazard areas in blue. The Lowcountry counties range from red to yellow showing a moderate to high hazard potential (Figure 24). In addition, according to SCEMD (n.d.), most of the Lowcountry area east of Interstate 95 has a high potential for liquefaction (Figure 25).

Figure 24: Earthquake Risk – Peak Ground Acceleration of 2% in 50 Years



Source: Hazards and Vulnerability Research Institute (HVRI)

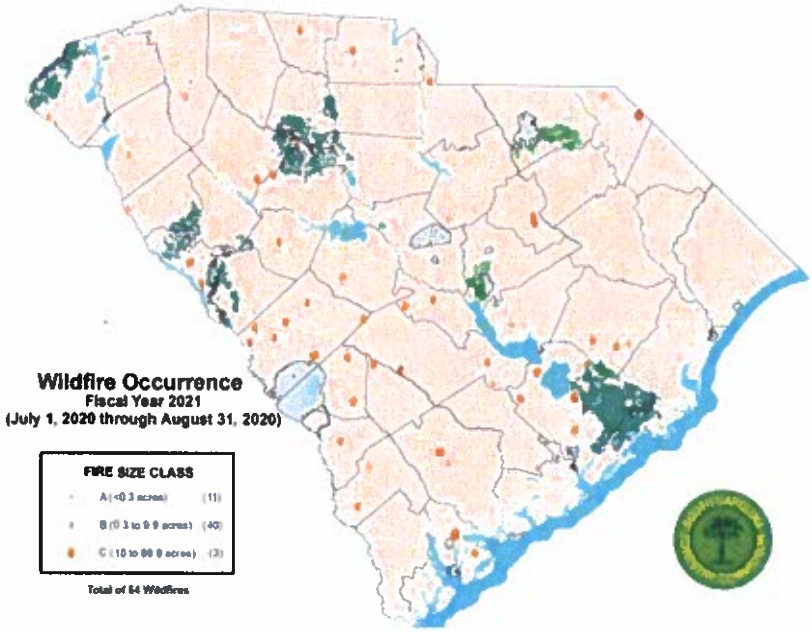
Figure 25: Geologic Hazards of South Carolina – Liquefaction Potential



Source: SC Emergency Management Division (SCEMD)

3.9 WILDFIRE

Characteristics and Classification



According to the South Carolina Forestry Commission (SCFC) (2020), a wildfire includes any outdoor fire that is not controlled and supervised. Wildfires damage forests, natural habitats, water quality, and air quality. The state's fire season extends from winter to early spring when the vegetation is dormant and dry.

Wildfires have several origins, some natural and some human. They spread faster with dry and windy conditions, burning fuels that include trees, brush, pine straw, and grasses. The causes identified by the SCFC are below (SCFC, 2020).

- *Debris Burning:* Any fire that escapes a planned setting falls into this category. This includes burning trash and prescribed burns. These account for 35% to 45% of South Carolina wildfires.
- *Woods Arson:* Fires that are set to one's property without their permission, regardless of intent. Arson accounts for 25% to 30% of South Carolina wildfires.
- *Equipment Use:* Fires started inadvertently with farm equipment or automobiles account for 5% of South Carolina wildfires.
- *Children:* Children's actions, including playing with fireworks, matches, and lighters cause 3% to 5% of South Carolina wildfires.
- *Smoking:* Although difficult to verify, careless smoking practices cause an estimated 3% to 4% of South Carolina wildfires, mostly along roadways.
- *Campfires:* Campfires make up 1% to 3% of wildfires. Most campfires are in the summer, when lush vegetation makes growth fire-resistant, which explains the low number.
- *Lightning:* Usually joined by rain and already humid summer conditions, lightning rarely spark wildfires. Lightning causes only 2% of South Carolina wildfires.
- *Railroad:* Given changes in engine technology, these types of wildfires are less common. Fires originate from sparks via braking or carbon build-up in the engines. These account for 1% to 2% of South Carolina's wildfires.
- *Miscellaneous:* This category catches all other wildfires, including accidental fires via fireworks, structural fires that light brush afire, and unattended warming fires. This category accounts for 4% to 6% of wildfires.

Location and Extent

Since 2005, over 3,300 wildfires occurred in the Lowcountry region. Nearly 40% of these were in Colleton County (Table 24). One of the most notable recent fires was on January 15, 2011. Persistent dry conditions across southern South Carolina gave rise to wildfires near Beaufort County, with damages totaling $1.12 million.

Table 24: Wildfire Events 2005-2019 by Acres Burned

	Number Small Wildfires (burn < 15.5 acres)	Number Medium Wildfires (burn 15.5-32.8 acres)	Number Large Wildfires (burn > 32.8 acres)
Beaufort County	372	18	8
Colleton County	1,204	76	59
Hampton County	564	26	29
Jasper County	864	41	56
Total	**3,004**	**161**	**152**

Source: SC Forestry Commission (SCFC)

Beaufort County

With a moderate risk of wildfire events, Beaufort County had 398 wildfires between 2005-2019. The majority of events (93.5%) are small-sized fires (less than 15.5 acres), 4.5% are medium (15.5-32.8 acres), and 2% are large (more than 32.8 acres). Between 2012-2019, the large annual wildfires concentrated in the northern part of the county.

Colleton County

The county has the highest risk of wildfire events. Between 2005-2019, there has been 1,339 wildfires in the county where 90% are small-sized fires (less than 15.5 acres), 5.6% are medium (15.5-32.8 acres), and 4.4% are large wildfires (more than 32.8 acres). Recently, large annual wildfires concentrated in the northern Colleton County, especially in the City of Walterboro and the Town of Smoaks.

Hampton County

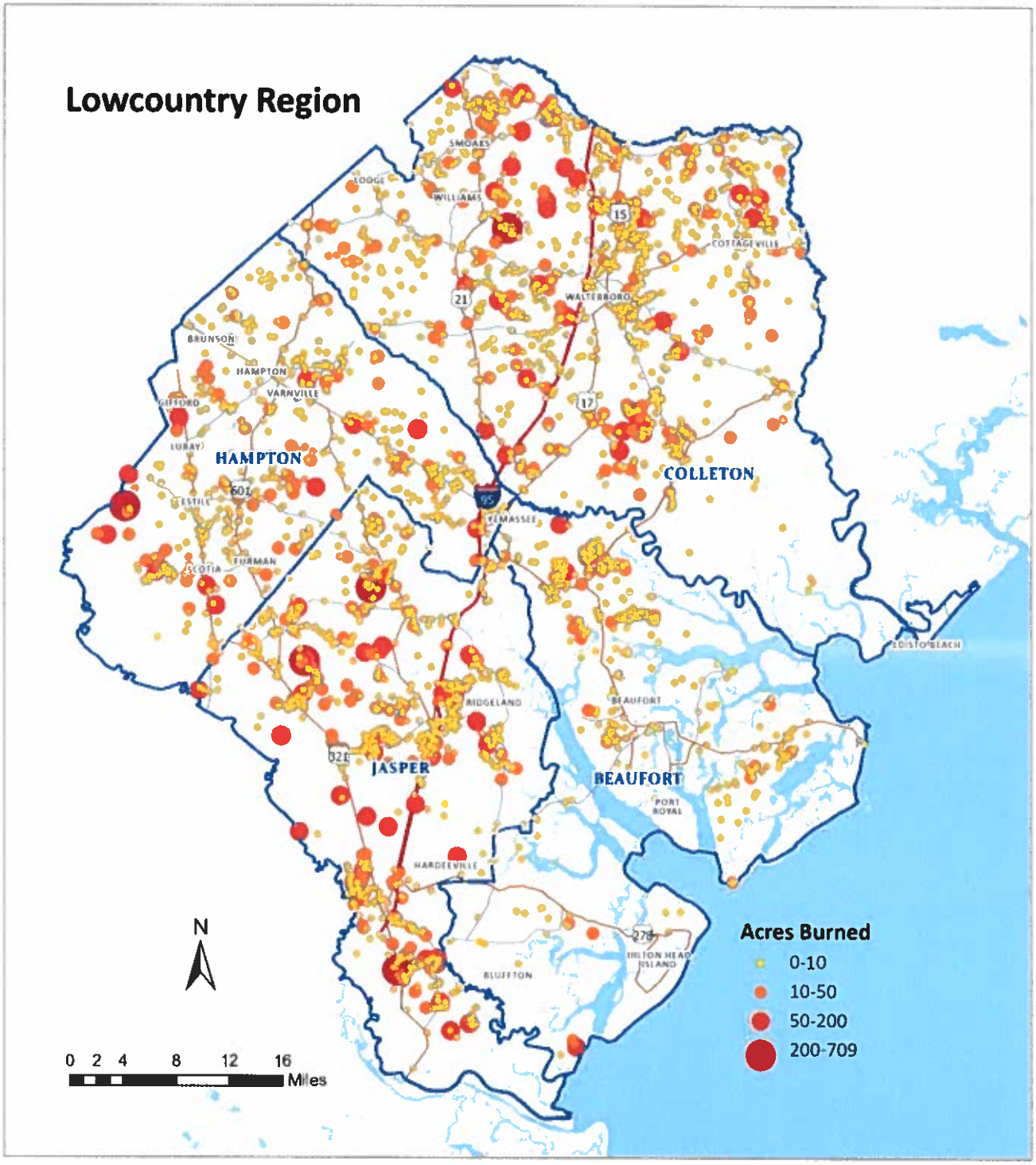
Hampton County has a high risk of wildfire events. Between 2005-2019, there has been 619 wildfires in the county where 91.1% are small-sized fires (less than 15.5 acres), 4.2% are medium (15.5-32.8 acres), and 4.7% are large wildfires (more than 32.8 acres). Recently, large annual wildfires concentrated are in the area of the Towns of Estill, Scotia, and Varnville.

Jasper County

The county has a high risk of wildfire events. Between 2005-2019, there have been 961 wildfires in the county where 89.9% are small-sized fires (less than 15.5 acres), 4.3% are medium (15.5-32.8 acres), and 5.8% are large wildfires (more than 32.8 acres). Recently, both the City of Hardeeville and the Town of Ridgeland have had the concentration of annual wildfires.

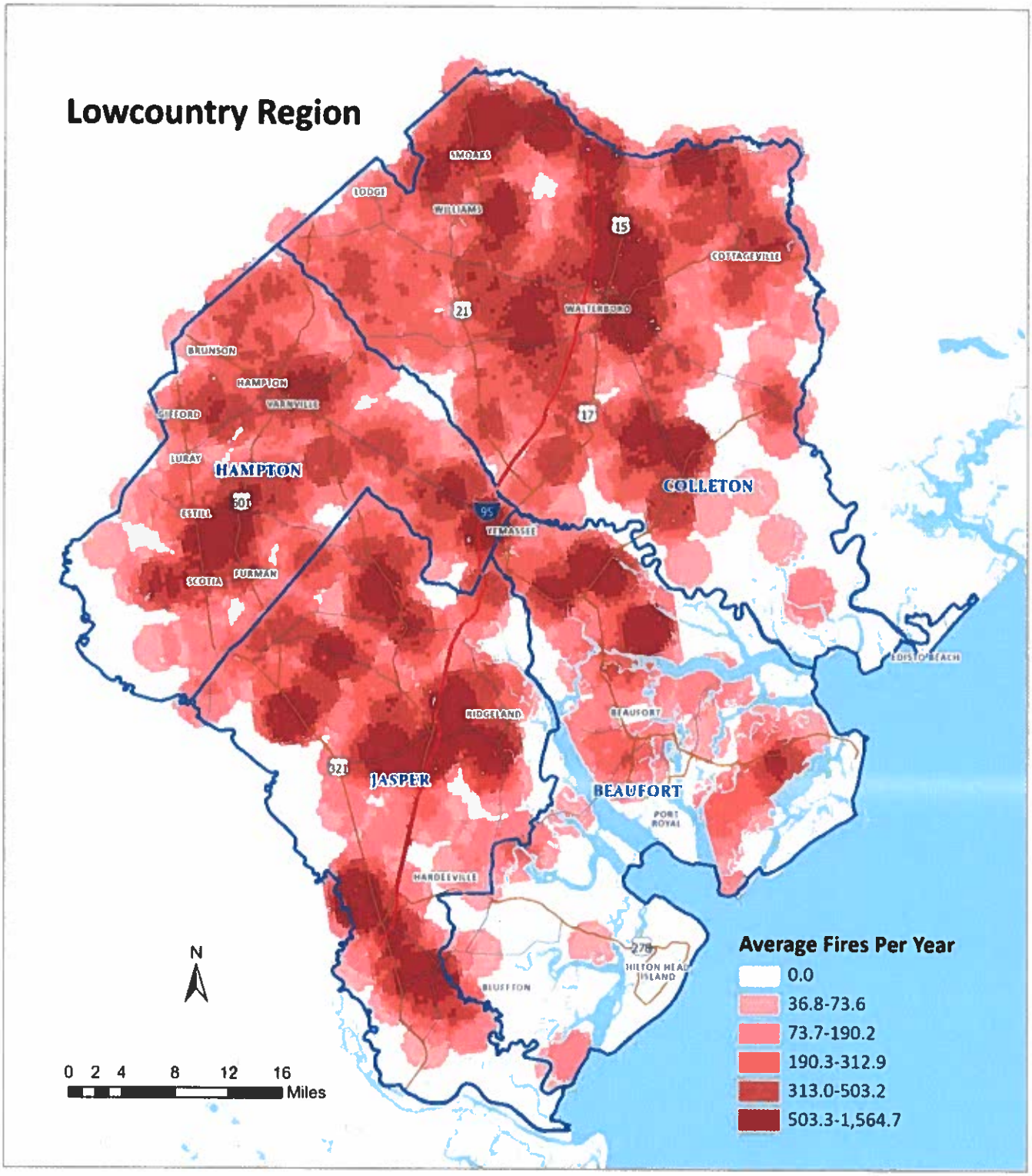
The location of the fires by size shows the inland area at higher risk from the immediate coastline (Figure 26). This pattern is highlighted even more in the recent period (2012-2019) showing a large annual concentrated occurrence of wildfires in northern Colleton County, with smaller concentrations in the other three counties (Figure 27).

Figure 26: Wildfire Locations 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI); South Carolina Forestry Commission (SCFC)

Figure 27: Annual Wildfire Risk 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI); South Carolina Forestry Commission (SCFC)

Future Probability

Table 25 shows that the future probability of wildfire events is very high particularly in Colleton and Jasper Counties, with more than 10,000% chance of occurring in any given year.

Table 25: Wildfire Historical and Recent Hazards Events 1988-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	1,728	32	54	0.02	5,400%	137
City of Beaufort	n/a	32	n/a	n/a	n/a	n/a
Town of Bluffton	n/a	32	n/a	n/a	n/a	n/a
Town of Hilton Head Island	n/a	32	n/a	n/a	n/a	n/a
Town of Port Royal	n/a	32	n/a	n/a	n/a	n/a
Colleton County	4,910	32	153.4	0.01	15,344%	607
Town of Cottageville	n/a	32	n/a	n/a	n/a	n/a
Town of Edisto Beach	n/a	32	n/a	n/a	n/a	n/a
Town of Lodge	n/a	32	n/a	n/a	n/a	n/a
Town of Smoaks	n/a	32	n/a	n/a	n/a	n/a
City of Walterboro	n/a	32	n/a	n/a	n/a	n/a
Town of Williams	n/a	32	n/a	n/a	n/a	n/a
Hampton County	2,075	32	64.8	0.02	6,484%	268
Town of Brunson	n/a	32	n/a	n/a	n/a	n/a
Town of Estill	n/a	32	n/a	n/a	n/a	n/a
Town of Furman	n/a	32	n/a	n/a	n/a	n/a
Town of Gifford	n/a	32	n/a	n/a	n/a	n/a
Town of Hampton	n/a	32	n/a	n/a	n/a	n/a
Town of Luray	n/a	32	n/a	n/a	n/a	n/a
Town of Scotia	n/a	32	n/a	n/a	n/a	n/a
Town of Varnville	n/a	32	n/a	n/a	n/a	n/a
Town of Yemassee	n/a	32	n/a	n/a	n/a	n/a
Jasper County	3,771	32	117.8	0.01	11,784%	387
City of Hardeeville	n/a	32	n/a	n/a	n/a	n/a
Town of Ridgeland	n/a	32	n/a	n/a	n/a	n/a

Note: Data are not available in municipality level.
Source: Hazards Vulnerability and Research Institute (HVRI) and South Carolina Forestry Commission

3.10 FLOOD

Characteristics and Classification

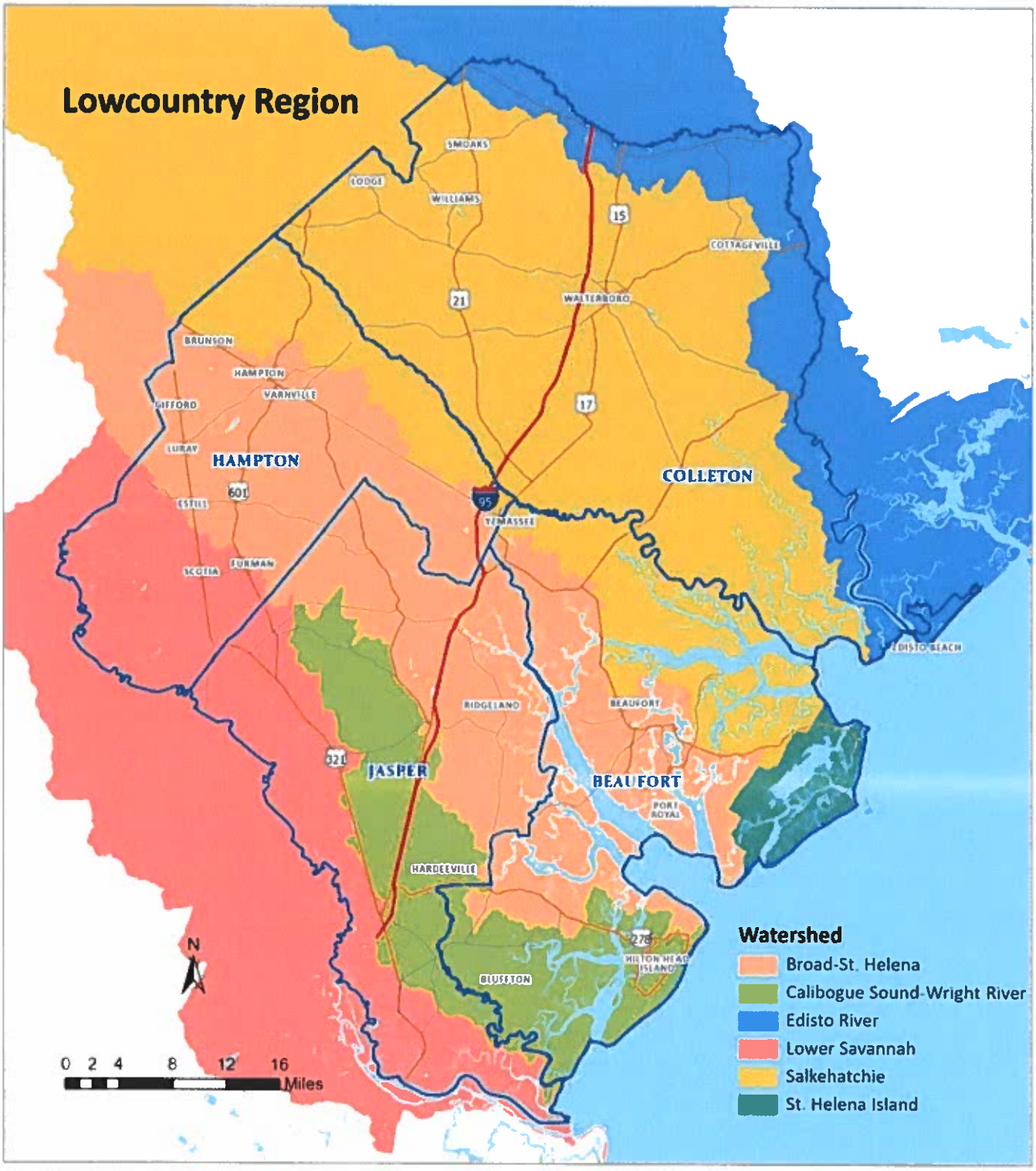
Flooding occurs when water flows or collects in areas that are usually dry. This can happen because of heavy rain, snow melt, high tides, dam breaks, etc. Floods can be for short duration or last weeks, and they can be a few inches or the height of houses. Floods claim more lives in the U.S. than tornadoes, hurricanes, or lightning. Moreover, flooding is the most expensive natural disaster, costing $5 billion on average every year (NSSL, 2020c). Given the Lowcountry's position in the low-lying coastal plains of South Carolina, not only is there a risk from riverine flooding from the lower Savannah River and ACE Basin (Ashepoo, Combahee, and Edisto) as rivers and their tributaries make their way to the Atlantic (Figure 28), but the region is also at increased risk for coastal flooding, storm surges, and tidal (King Tides) flooding.

There are two general types flooding—general flooding where flooding occurs over several days, and flash flooding where floodwaters rise quickly within minutes to hours and then quickly dissipate. According to the 2018 South Carolina Hazards Mitigation Plan (SCEMD, 2018), examples of flash flood types include urban, dam/levee failures, and debris/ice jams. General floods include riverine, coastal, and local drainage. The following flood types predominate in the Lowcountry.

- *River (or riverine) Flood:* Also called overbank flooding, this type of flooding occurs when water levels in a river exceed the rivers defined banks and spill over into the surrounding floodplain.
- *Coastal Flood:* This type of flooding is the product of a several factors. When coastal waters are higher-than-high tide, those waters can swell onto low-lying areas, and it can get worse by rainfall or winds pushing water onshore. King tides are abnormally high tides that occur when the moon, earth, and sun align, and the moon is at its closest position to earth. These events occasionally generate coastal flooding and can be exacerbated by wind and rain. Sea level rise means these events will happen more frequently (City of Charleston, 2020).
- *Local Drainage Flooding:* Local drainage problems frequently occur in low-lying flat areas where normal drainage patterns become disrupted by lack of maintenance of channels or culverts, lower capacity storm sewer systems, or other types of blockages.
- *Flash Flood:* Flash flood events are rapid onset events usually the result of intense rainfall occurring in a short time span, typically less than 6 hours. Urbanized areas contribute to flash flooding due to the number of impervious surfaces (roads, parking lots, streets) that prevent the rainfall from being absorbed by the soil. The runoff moves quickly over the paved surfaces increasing the likelihood of flash flooding especially in lower-lying areas such as road or rail underpasses.

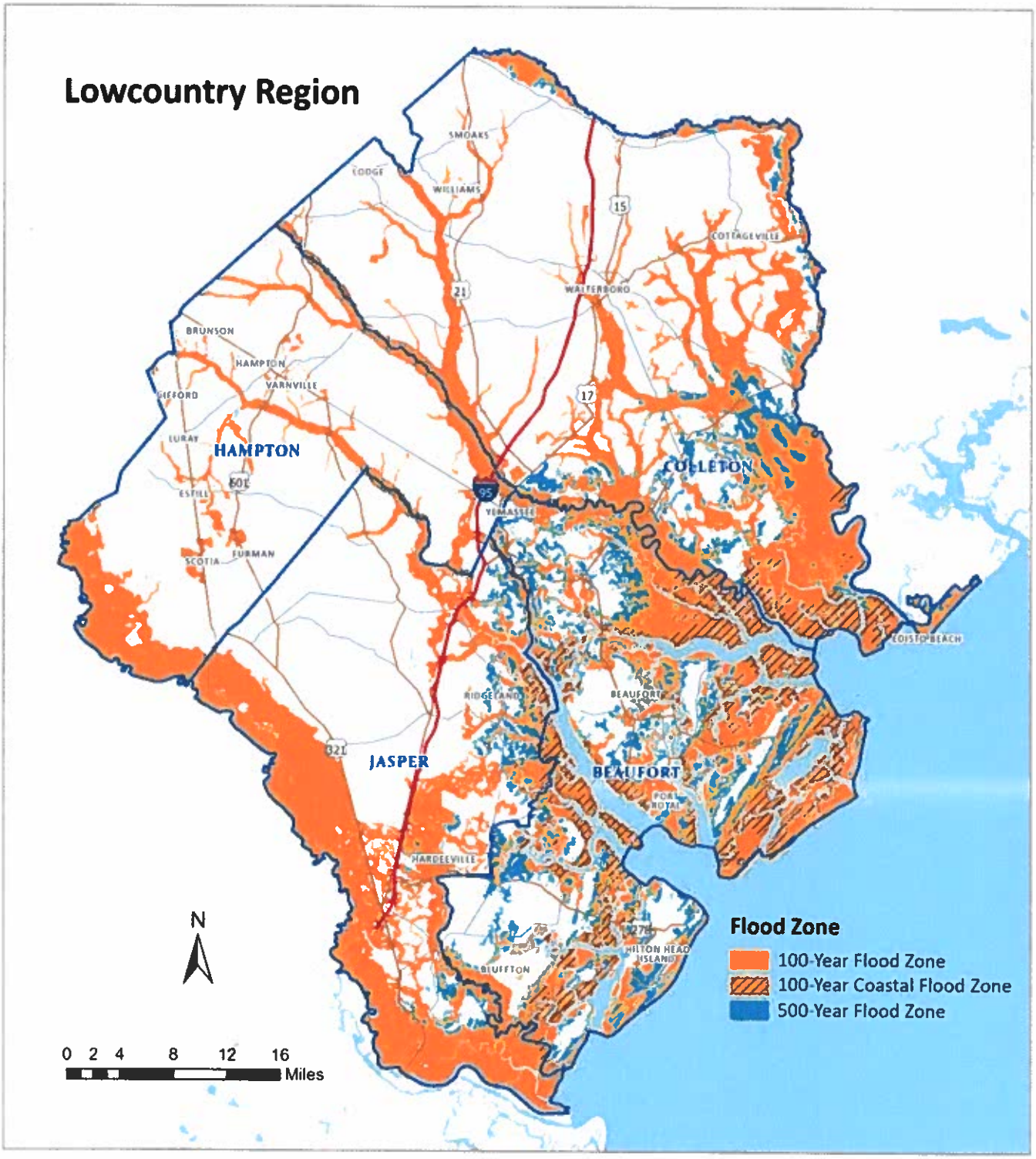
Flooding is a major hazard threat in the Lowcountry region as it combines both coastal flood hazards and riverine flood hazards. Approximately 41% of the land area in the four-county region lies within FEMA's regulated flood zone (Special Flood Hazard Area of SFHA, commonly known as the 100-year flood zone). Within the SFHA, 9% of the land area is in the VE zone and subject to wave action greater than 3 feet. The VE zone represents the highest flood risk potential. The SFHA has a one percent probability of occurring in any given year, while the 500-year flood hazard has a 0.2% probability (Figure 29). Approximately 4.6% of the Lowcountry land area lies within the 500-year flood zone. Coastal flood hazard areas (shown in the crosshatch pattern in Figure 29) include VE zones, coastal AE zones with wave heights from 1.5-3 feet, and AE zones designated as Limit of Moderate Wave Action (LiMWA) with wave heights less than 1.5 feet (FEMA, 2020c). Figure 30 illustrates the coastal flood hazard layers. More details on definition of flood zone can be seen in Appendix F.

Figure 28: Drainage Areas – Watershed



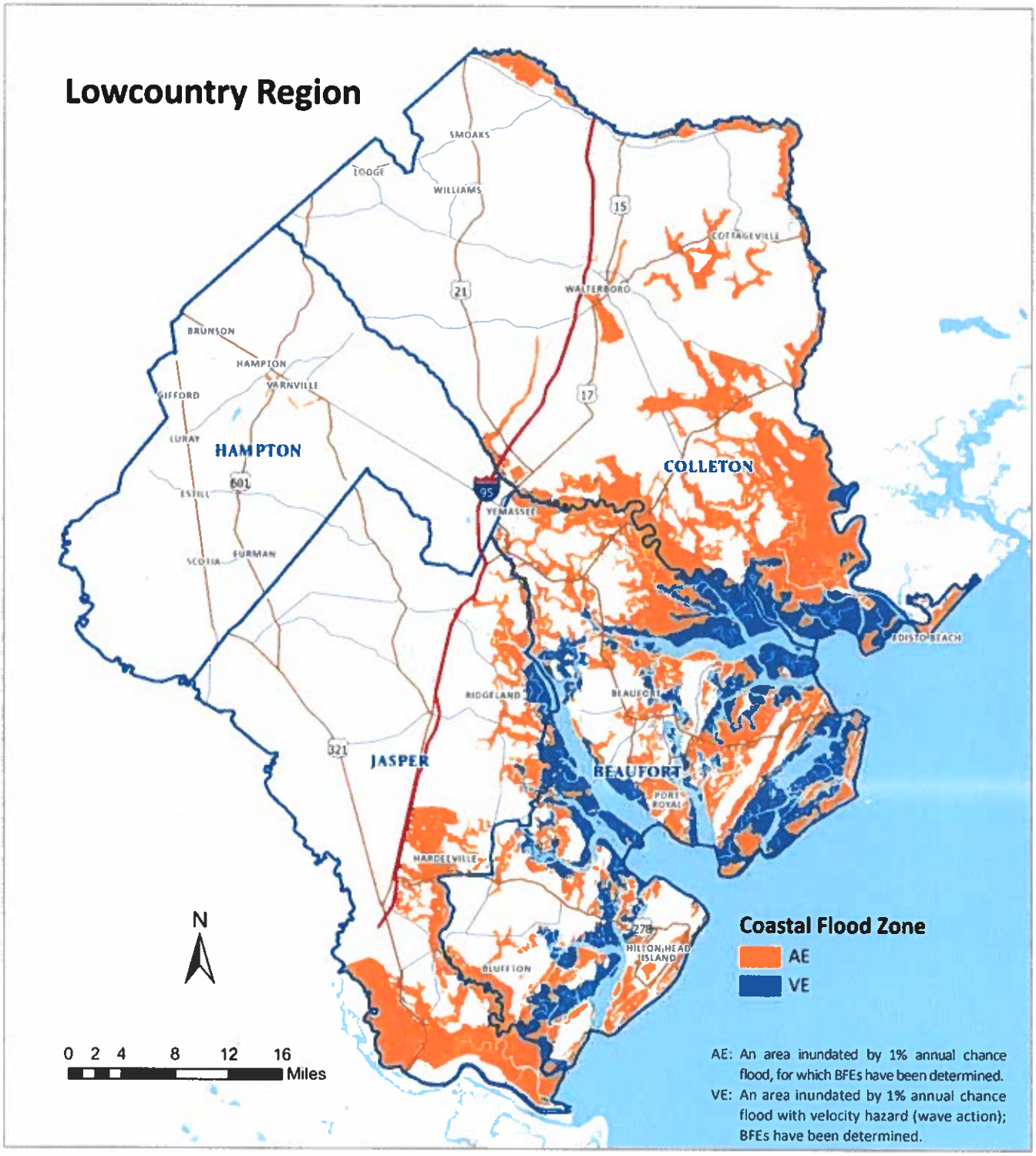
Source: US Geological Survey (USGS), Watershed Basin Dataset

Figure 29: FEMA-Designated Flood Zones



Source: Hazards and Vulnerability Research Institute (HVRI); National Flood Insurance Program

Figure 30: FEMA-Designated Coastal Flood Zones

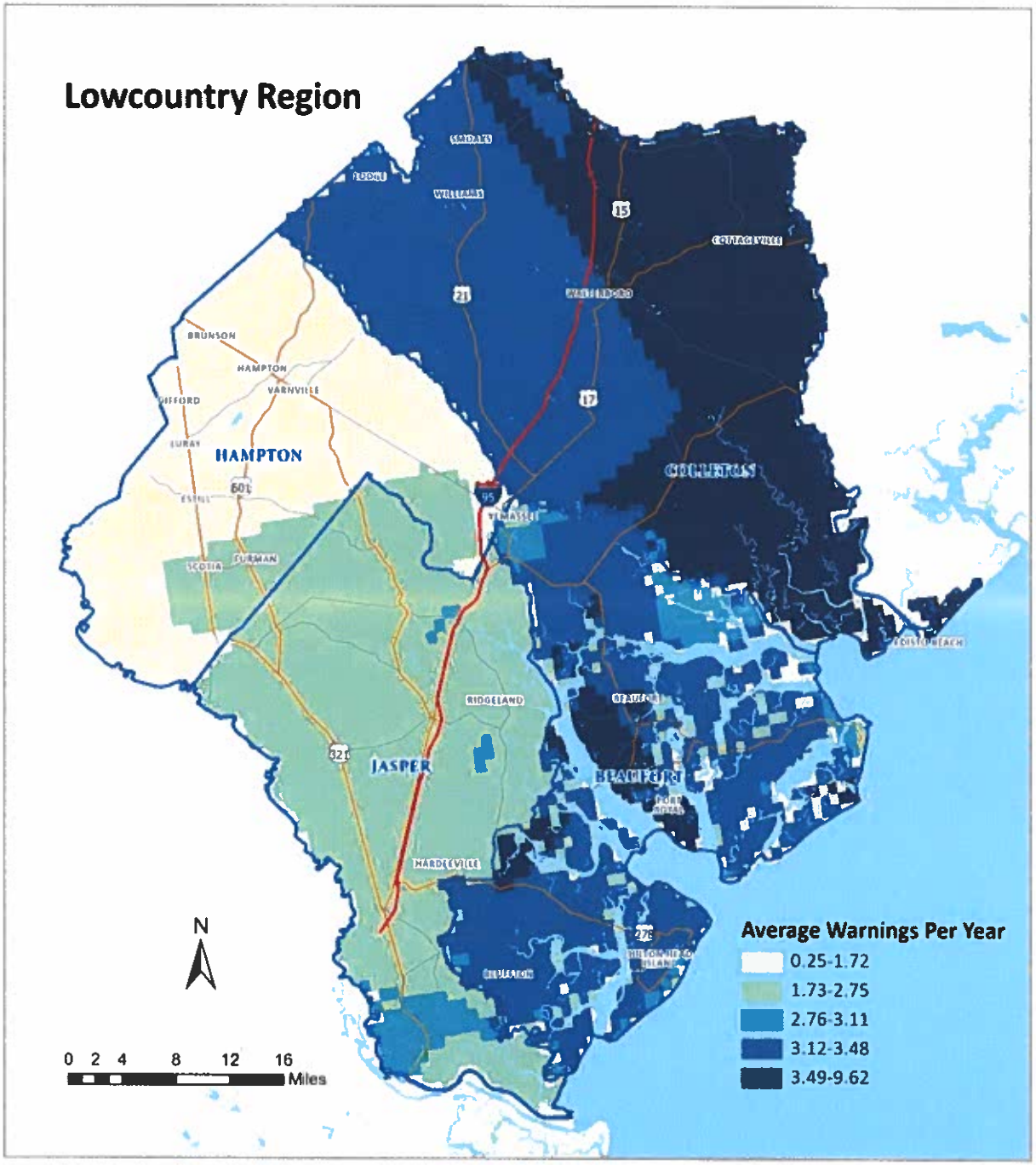


Source: Hazards and Vulnerability Research Institute (HVRI); National Flood Insurance Program

Flash Flooding

Because of the rapidity of occurrence and the localized conditions that are quite variable, one way of determining flash flooding is to use National Weather Service flash flood guidance which shows the geographic distribution of the potential risk. As shown in Figure 31, most of the Lowcountry averages around 3 flash flood warnings per year, but major sections of Beaufort County and eastern Colleton show higher than average warnings per year suggesting a slightly higher risk level for flash flooding.

Figure 31: Flash Flood Warnings 2012-2019

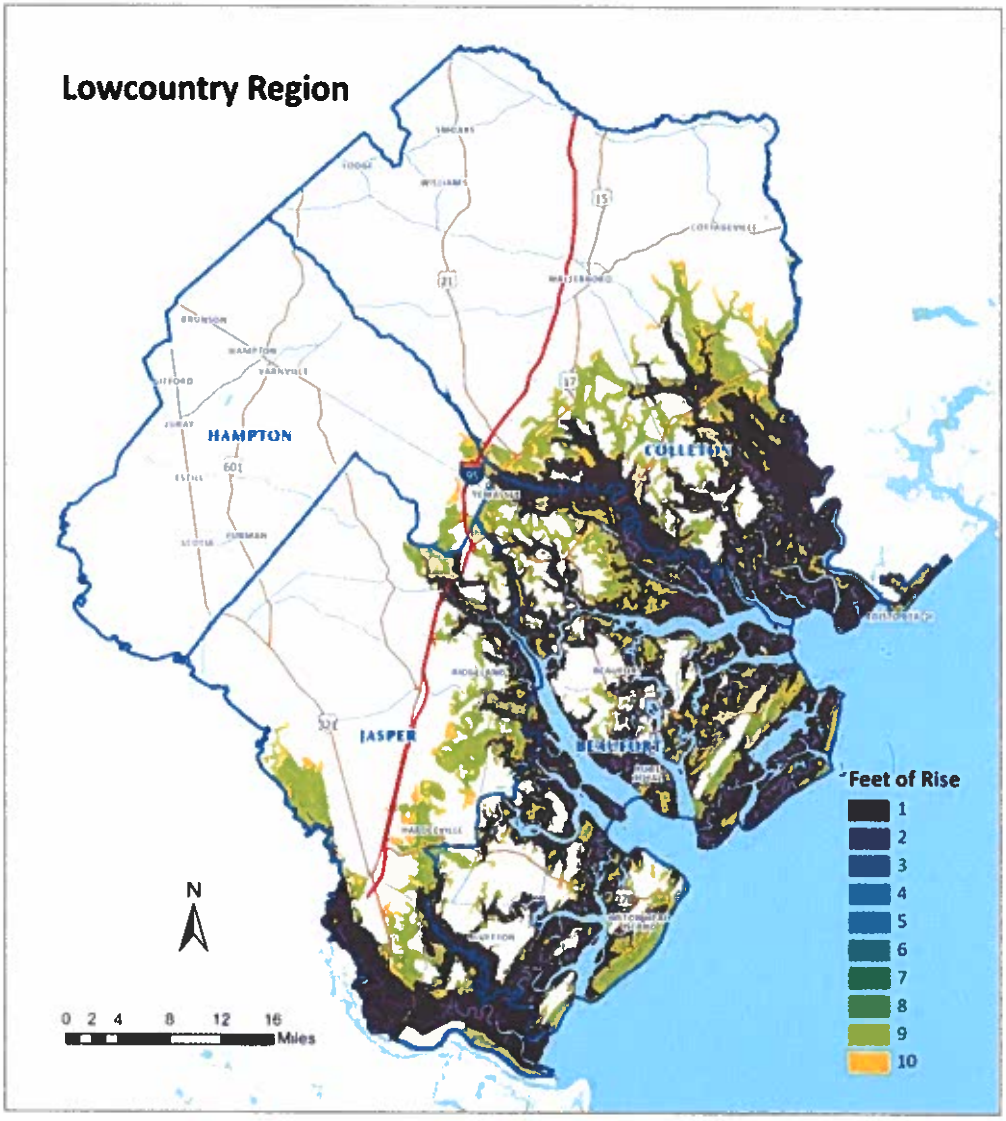


Source: Hazards and Vulnerability Research Institute (HVRI); National Weather Service, Iowa Environmental Mesonet

Sea Level Rise

Given the Lowcountry's position on the Atlantic Coast, the Lowcountry is at special risk for sea level rise. The rate of sea level rise is very likely to be higher in the remainder of the 21st century than it was in the last 50 years. The Fort Pulaski (Georgia) station, NOAA's water level station, has recorded sea level since 1935, and in this period, the mean sea level has increased at a rate of about 1.09 feet per 100 years (NOAA, 2020). Sea level rise threatens infrastructure like buildings, power plants, roads, and railways. The encroaching saltwater can poison freshwater habitats and agricultural water supplies. It also means that storm surge and coastal flooding will be more severe and more frequent. Approximately 22% of the Lowcountry's land area is subject to one to two feet of inundation from sea level rise. Using 2018 population estimates from the American Community Survey, roughly 68,000 people live in the potential inundation areas (Census block groups where more than 50.1% of the land area would be covered) by a one-to-two-foot rise in sea levels, or 25% of the region's population (Figure 32).

Figure 32: Sea Level Rise Impact



Source: Hazards and Vulnerability Research Institute (HVRI); NOAA Sea Level Rise Viewer

Location and Extent

According to the National Weather Service (n.d.-c), there are three categories to define the severity of flood impacts in the corresponding river/stream reach (Table 26.)

Table 26: Flood Stage

Flood Stage	Description of Flood Impacts
Minor Flooding	Minimal or no property damage, but possible some public threat. ▪ Water over banks and in yards. ▪ No building flooded, but some water may be under buildings built on stilts (elevated). ▪ Personal property in low lying areas needs to be moved or it will get wet. ▪ Water overtopping roads, but not very deep or fast flowing. ▪ Water in campgrounds or on bike paths. ▪ Inconvenience or nuisance flooding. ▪ Small part of the airstrip flooded, and aircraft can still land. ▪ One or two homes in the lowest parts of town may be cut off or get a little water in the crawl spaces or homes themselves if they are not elevated.
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary. ▪ Several buildings flooded with minor or moderate damage. ▪ Various types of infrastructure rendered temporarily useless (i.e. Fuel tanks cannot be reached due to high water, roads flooded that have no alternates, generator station flooded). ▪ Elders and those living in the lowest parts of the village are evacuated to higher ground. ▪ Access to the airstrip is cut off or requires a boat. ▪ Water over the road is deep enough to make driving unsafe. ▪ Gravel roads likely eroded due to current moving over them. ▪ Widespread flooding, but not deep enough to float ice chunks through town ▪ Water deep enough to make life difficult, normal life is disrupted and some hardship is endured. ▪ Airstrip closed. ▪ Travel is most likely restricted to boats.
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary. ▪ Many buildings flooded, some with substantial damage or destruction. ▪ Infrastructure destroyed or rendered useless for an extended period of time. ▪ Multiple homes are flooded or moved off foundations. ▪ Everyone in threatened area is asked to evacuate. ▪ National guard units assist in evacuation efforts. ▪ Erosion problems are extreme. ▪ The airstrip, fuel tanks, and the generator station are likely flooded. ▪ Loss of transportation access, communication, power and/or fuel spills are likely. ▪ Fuel tanks may float and spill and possibly float downstream. ▪ High damage estimates and high degree of danger to residents.

Source: National Weather Service (NWS)

During the time leading up to Hurricane Joaquin (October 3-5, 2015) the state received up to 20 inches of rain in 4 days, spurring both flash and coastal floods. Damaged infrastructure, businesses and homes took months to repair.

There have been 67 flood events recorded from 2012-2019 in the Lowcountry region (NCEI 2020a). The majority of these were listed as flash flood events. Beaufort County experienced the most flooding (primarily coastal), followed by Colleton County, with an even distribution of flood types (Table 27). Some notable floods events that impacted communities are documented below. Unless otherwise specified, there are no known flood depths.

Table 27: Recent Flood Types 2012-2019

County	Flood	Flash Flood	Coastal Flood
Beaufort	-	5	17
Colleton	6	7	6
Hampton	-	13	-
Jasper	-	13	-
Total	6	38	23

Source: NCEI, 2020a

Beaufort County

There have been 22 flood events recorded from 2012-2019 in the county. These events consisted primarily of coastal floods. Total damage of $10,607 was reported.

- July 21, 2014: Areas of numerous to widespread showers and thunderstorms developed in the afternoon hours and anchored along the southeast South Carolina coast and produced flash flooding in Beaufort County.
- October 27 and 28 2015: Major coastal flood stage levels were recorded at the Charleston Harbor (CHTS1) tide gauge. This impacted the county coastal area. Law enforcement and park services indicated road closures on Dockside Road, Yacht Club Road, Scott Creek Road, Jungle Shores Drive and Palmetto Boulevard near the entrance of Edisto Beach State Park. A flood berm along Palmetto Boulevard was also reported destroyed and water was under beach homes. Twenty structures sustained flood damage, including two businesses and 18 homes. Also, several roads flooded, and water was around some homes.
- August 29, 2019: There were a few days of moderate to major coastal flooding during high tide cycles near the Southeast South Carolina coast. There was a report that a boat ramp on Bay Street and a boat ramp near Pigeon Park flooded.

Town of Hilton Head Island

- July 21, 2014: A flash flood causing a vehicle stalled in three feet of water on North Calibogue Cay Road. An estimated six inches of water in a foyer and a completely flooded elevator shaft in a building along Lighthouse Road was reported.
- October 8, 2016: A local newspaper showed video at the Tabby Walk Villas on Hilton Head Island flooded with an unknown depth of water entering first floor units. A portion of Fort Walker Drive was also undermined and completely collapsed during heavy rain associated with Hurricane Matthew.

City of Beaufort and Towns of Bluffton and Port Royal

- There was no record of flood events in the city and towns between 2012-2019.

Colleton County

There have been 19 flood events recorded from 2012-2019 in the county. The damage totaled over $2.15 million. The flood risk map of Colleton County and all jurisdictions are shown in Figure 33. The notable events include:

- July 11, 2013: Thunderstorms popped up in the afternoon, producing heavy rain over a short period of time. A roadway collapse on Carters Ford Road due to flash flooding was reported. The damage of $20,000 was also reported.
- October 3, 2015: Flash flooding was prevalent for several days. The most significant flooding occurred in areas along and near smaller creeks. An emergency manager reported a few roads near Walterboro closed due to flooding. Roads closed due to flooding included but are not limited to Cane Branch Road and Ruffin Road at a railroad crossing. Dodge Lane was also washed out due to flooding. The damage totaled $1.5 million.

Town of Cottageville

- July 12, 2013: Ongoing thunderstorms with near two inches of rain continued throughout the night causing area flooding. Happiness Lane was impassable due to the Edisto River flood.
- October 5, 2015: An emergency manager reported several roads closed due to rising river levels on the Edisto River. Roads closed included Long Creek Landing Road, Good Hope Landing Lane, Ladolce Lane, Pierce Road and the end of Lakeview Lane.

Town of Edisto Beach

- October 14, 2016: Strong wind and long fetch over coastal waters produced a series of elevated tides and shallow coastal flooding along coastal areas. Law enforcement reported saltwater up to and beginning to flow under damaged homes on Palmetto Boulevard. Water did not reach the road.
- August 29, 2019: A few days of moderate to major coastal flooding during high tide cycles flooded Dockside Road. Water was several inches deep inside the building.

City of Walterboro

- October 3, 2015: Flash flooding was prevalent for several days. Law enforcement reported Ivanhoe Road closed between Forest Hill Road and West Washington Street due to flooding. The damage totaled $507,720 thousand.

Towns of Lodge and Smoaks

- There was no record of flood events in the recent year (2012-2019).

Hampton County

Between 2012-2019, there have been 13 flood events in the county causing a light damage of $7,545 reported. The notable events include:

- June 4, 2013: Severe thunderstorm produced heavy rain over a short period of time across the county. The estimated five inches of rain had already fallen since midafternoon. Many farm fields in Valentine completely flooded.
- July 11, 2013: Numerous thunderstorms popped up in the afternoon producing heavy rain over a short period of time. Several roads in Nixville were closed due to flash flooding.
- October 8, 2018: Heavy rains from passing Hurricane Matthew resulted in two sections of Pocotaligo Road being washed out where water was overflowing from Buckfield Pont into the Tulifiny River. A section of Pocoaligo Road was also washed out near the Vizsla Loop.

Town of Brunson

- July 11, 2013: Numerous thunderstorms popped up in the afternoon producing heavy rain over a short period of time. Several road closures were reported closed due to flash flooding. Light damage was reported.

Town of Estill

- June 4, 2013: Severe thunderstorm produced heavy rain over a short period of time. Significant standing water along Jackson Street and surrounding yards were reported. No damage was reported.

Town of Furman

- June 6, 2016: Heavy rain associated with the Tropical Storm Colin caused a roadway washout near the intersection of Town Hall Road and Highway 601. No damage was reported.

Town of Hampton

- August 19, 2013: Numerous showers and thunderstorms developed across the region. Law enforcement reports that portions of Highway 278 were closed due to flash flooding. Several side streets off of Highway 278 were closed including Willard, 3rd, 5th, and Holly. Also, Highway 363 and Wade Hampton were closed as well as Highway 601 and Magnolia. No damage was reported.

Town of Luray

- July 11, 2013: Numerous thunderstorms popped up in the afternoon producing heavy rain over a short period of time. Several road closures were reported closed due to flash flooding. Light damage was reported.

Town of Varnville

- July 11, 2013: Numerous thunderstorms popped up in the afternoon producing heavy rain over a short period of time. Dennis Boulevard, Maple Street, Main Street and several others were flooded and closed. Light damage was reported.

Towns of Gifford, Scotia, and Yemassee

- There was no record of flood events in recent years (2012-2019).

Jasper County

There have been 13 flood events in the county between 2012-2019. These resulted in $35,443 in financial loss. The notable events include:

- May 29, 2016: A Tropical Storm Bonnie impacted across portions of southeast South Carolina and southeast Georgia. The storm totaled rainfall amounts of six to ten inches in many areas and resulted in flash flooding in Jasper County. There was significant flooding ongoing on Interstate 95 near mile marker 22. Both the northbound and southbound lanes are closed and completely impassable. Highway 17 was also flooded near Interstate 95 and a gas station had an unknown amount of water in the building. A few cars were submerged in the flood waters on both Interstate 95 and Highway 17. Interstate 95 was closed between exit 18 and exit 24 for almost 24 hours. The damage totaled $10,000.
- September 11, 2017: The widespread heavy rain associated with Hurricane Irma resulted in several reports of flash flooding with water entering homes and businesses. Jasper County Emergency Management reported homes flooded and inaccessible on Cherry Hill Road near the intersection with Highway 462. At least one person was stranded and in need of rescue. The damage totaled $25,000.

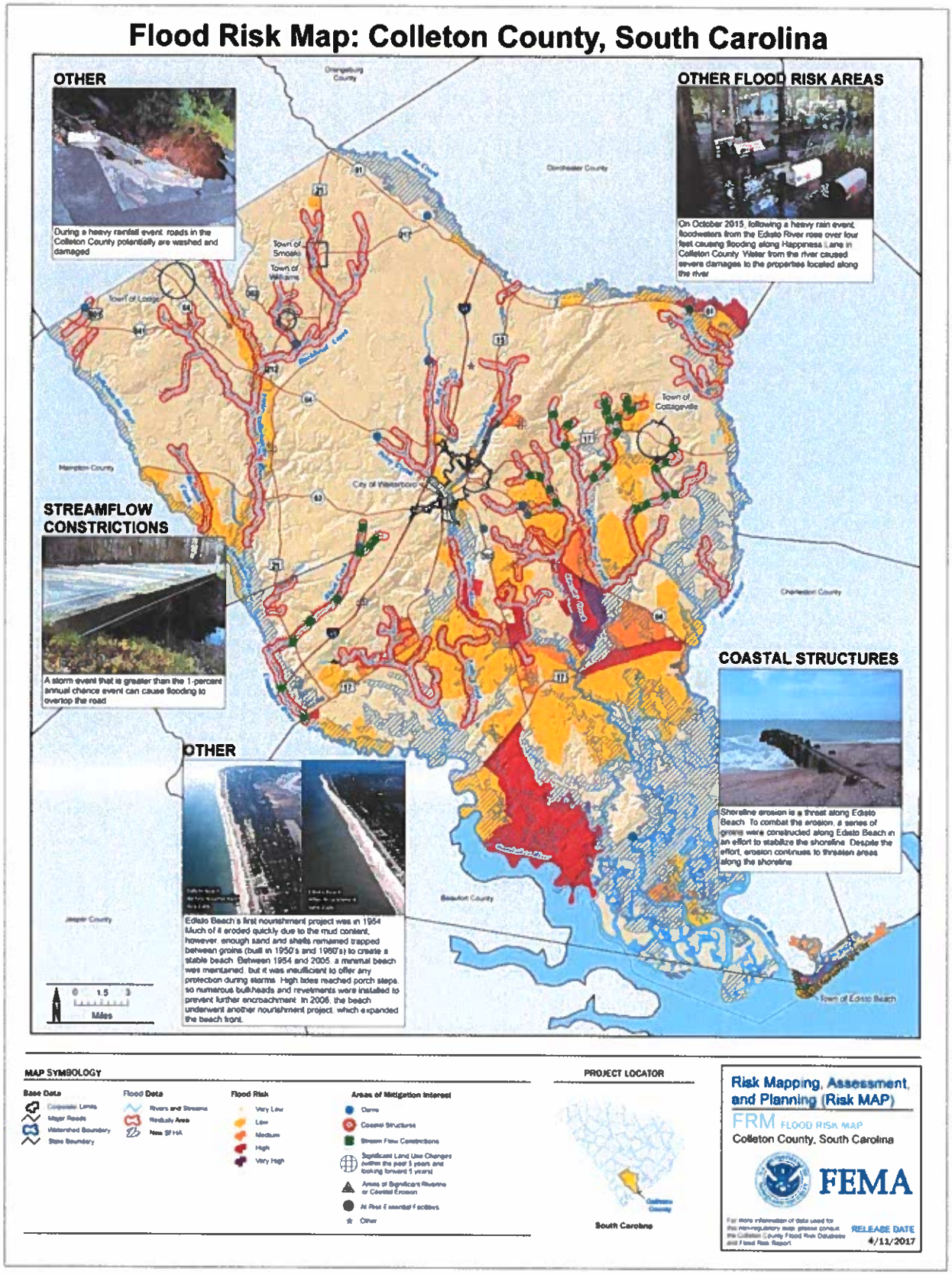
City of Hardeeville

- There was no record of flood event in the city between 2012-2019.

Town of Ridgeland

- May 29, 2016: Tropical Storm Bonnie impacted many areas and resulted in flash flooding. Main Road in Ridgeland was flooded and closed. Also, numerous secondary roads flooded or closed including portions of Calf Pen Bay Road, Captain Bill Road, Frontage Road, and Great Swamp Road. There was about six inches of water in a residence on Captain Bill Road. Also, water was entering a home on Brandon Cove.

Figure 33: Colleton County Flood Risk Map 2017



Source: Federal Emergency Management Agency (FEMA)

Future Probability

The future probability of flood events is high particularly in Beaufort County, with more than 100% chance of occurring in any given year (Table 28). The recent impact from flooding can be seen in the Loss Section.

Table 28: Flooding Historical and Recent Hazards Events 1996-2019

	Total Number	Years in Data Record	Annualized Count	Recurrence Frequency (in years)	Future Probability (% chance/year)	Total Number 2012-2019
Beaufort County	**32**	**24**	**1.3**	**0.75**	**133%**	**22**
City of Beaufort	4	24	0.2	6.00	17%	0
Town of Bluffton	5	24	0.2	4.80	21%	0
Town of Hilton Head Island	5	24	0.2	4.80	21%	1
Town of Port Royal	1	24	0.0	24.00	4%	0
Colleton County	**23**	**24**	**1.0**	**1.04**	**96%**	**19**
Town of Cottageville	1	24	0.0	24.00	4%	2
Town of Edisto Beach	0	24	0.0	*	*	5
Town of Lodge	0	24	0.0	*	*	0
Town of Smoaks	0	24	0.0	*	*	0
City of Walterboro	2	24	0.1	12.00	8%	1
Town of Williams	0	24	0.0	*	*	0
Hampton County	**8**	**24**	**0.3**	**3.00**	**33%**	**13**
Town of Brunson	1	24	0.0	24.00	4%	1
Town of Estill	2	24	0.1	12.00	8%	2
Town of Furman	1	24	0.0	24.00	4%	1
Town of Gifford	0	24	0.0	*	*	0
Town of Hampton	2	24	0.1	12.00	8%	2
Town of Luray	1	24	0.0	24.00	4%	1
Town of Scotia	0	24	0.0	*	*	0
Town of Varnville	2	24	0.1	12.00	8%	2
Town of Yemassee	0	24	0.0	*	*	0
Jasper County	**10**	**24**	**0.4**	**2.40**	**42%**	**13**
City of Hardeeville	1	24	0.0	24.00	4%	0
Town of Ridgeland	7	24	0.3	3.43	29%	6

Note: Symbol (*) refers to "no value" because the hazard events have a value of zero.
Source: Hazards and Vulnerability Research Institute (HVRI)

3.11 WINTER STORM

Characteristics and Classification

A winter storm includes events where the main types of precipitation are snow, sleet, or freezing rain. Most deaths related to winter storms, such as those involving automobiles, snow shoveling, and exposure to the cold are labeled as indirect deaths. All winter storms have some form of frozen precipitation which interact differently when on the ground. Sometimes storms can have multiple types of precipitation hazards.

Winter storms are a generic classification of cold-weather hazards. These include blizzards, ice storms, and nor'easters. There are many different types of hazard events associated with the generic category of winter storms (NSSL, 2020d). These are described below.

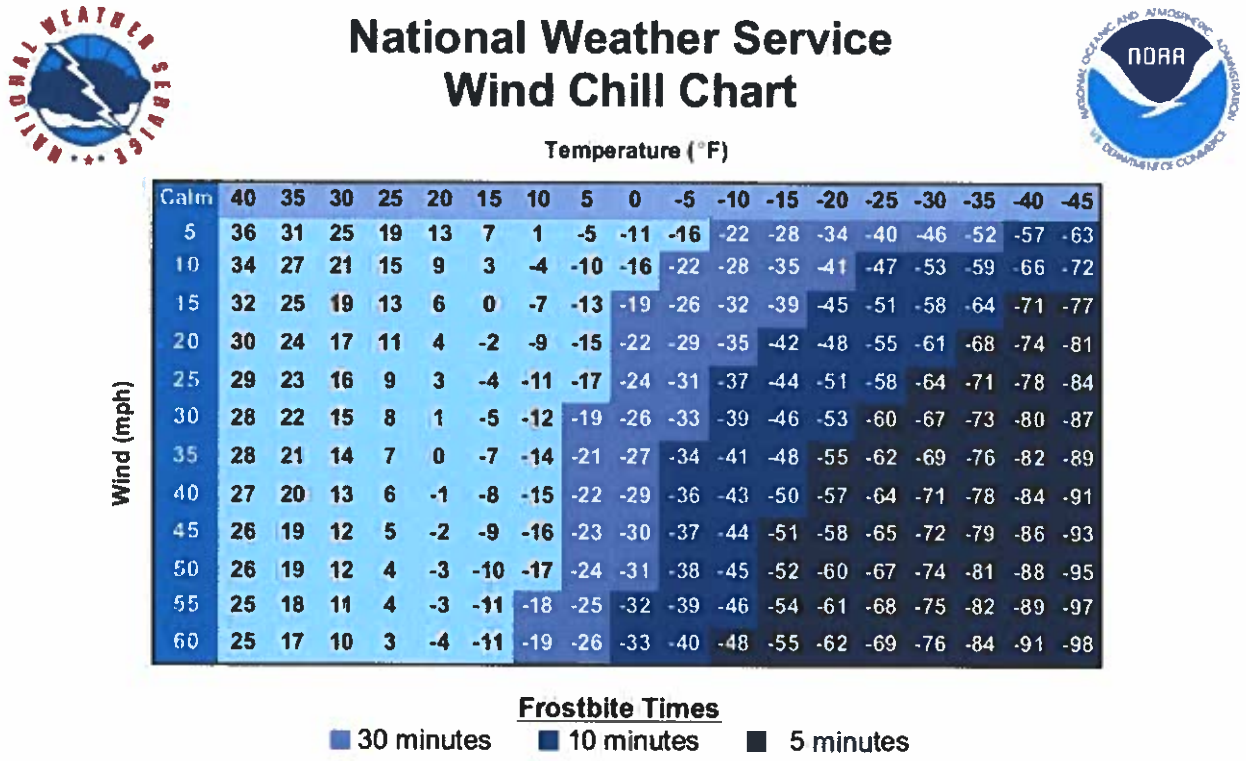
- *Blizzard:* Blizzards combine strong winds that either blow snow that has already fallen, or snow that comes with the storm. The wind paired with the snow inhibits visibility, making for very dangerous driving conditions and lasts for at least three hours.
- *Ice Storm:* An ice storm results with the accretion of at least 0.25 inches of ice on surfaces. The weight of ice can snap trees and power lines and makes for hazardous walking and driving conditions. Freezing rain starts as snow before its descent to the ground and melts completely in a thick layer of warm air. The now-water droplet goes through a thin layer of cold air just before it reaches the ground, making the water close to freezing temperatures as it strikes the ground. If the water lands on something cold enough, the water will freeze on contact. The ice will form a glaze on objects, trees, cars, roads, and power lines. If enough ice forms, then the event will be labeled an ice storm.
- *Snow:* Flakes form as water droplets freeze and stick together. Snow will reach the ground if it remains in air below 32F on its journey from the cloud to the ground and accumulates if ground temperatures are below freezing.
- *Nor'easter:* These are very strong coastal winter storms that form in the Atlantic Ocean. Heavy precipitation (rain and snow) and strong winds producing large waves are part of these systems and produce considerable beach erosion.

Location and Extent

National Weather Service (n.d.-d) provides an indication of the dangers from winter winds and freezing temperatures called "Wind Chill Temperature (WCT) Index" (Figure 34). It is a measure of how cold the wind makes real air temperature feel to the human body.

Table 29 shows another tool, "Winter Storm Severity Index (WSSI)," used by NWS. It provides the public with an indication of the level of winter precipitation (snow and ice) severity and its potential impacts (NWS, n.d.-e).

Figure 34: Wind Chill Temperature (WCT) Index



Source: National Weather Service (NWS)

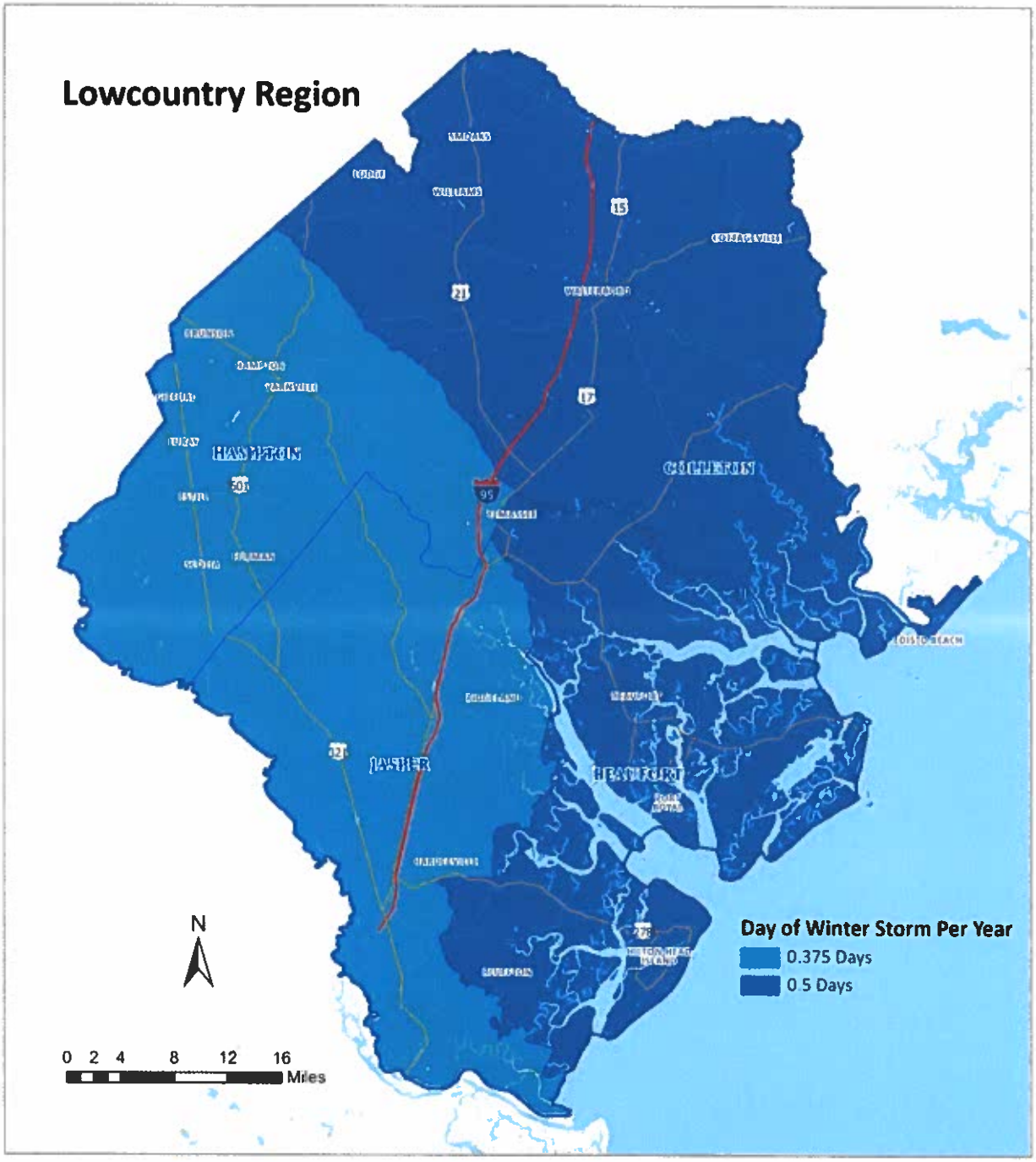
Table 29: Winter Storm Severity Index (WSSI)

Descriptor	Potential Winter Storm Impacts	General Description
None	Impacts not expected.	No snow or ice forecast and no potential Ground Blizzard conditions.
Limited	Rarely a direct threat to life and property. Typically results in little inconveniences.	Small accumulations of snow or ice forecast. Minimal impacts, if any, expected. In general, society goes about their normal routine.
Minor	Rarely a direct threat to life and property. Typically results in an inconvenience to daily life.	Minor disruptions, primarily to those who were not prepared. None to minimal recovery time needed.
Moderate	Often threatening to life and property, some damage unavoidable. Typically results in disruptions to daily life.	Definite impacts to those with little preparation. Perhaps a day or two of recovery time for snow and/or ice accumulation events.
Major	Extensive and widespread severe property damage, life saving actions will be needed. Results in extreme disruptions to daily life.	Significant impacts, even with preparation. Several days recovery time for snow and/or ice accumulation events.
Extreme	Extensive and widespread severe property damage, life saving actions will be needed. Results in extreme disruptions to daily life.	Historic. Widespread severe impacts. Many days to at least a week of recovery needed for snow and/or ice accumulation events.

Source: national Weather Service (NWS)

Winter storms generally affect large geographic areas. Given the southern and coastal location of the Lowcountry counties, winter storms are infrequent events, although nor'easters occasionally affect the region's beaches. According to the State Hazard Mitigation Plan 2018 (SCEMD, 2018), from 1986-2015, the four Lowcountry counties averaged two or less days of winter weather per year. For the 2012-2019 period, there were fewer occurrences—averages of less than one-half day for Beaufort and Colleton, and less than that for Hampton and Jasper (Figure 35). Below are some notable events across the Lowcountry region.

Figure 35: Winter Storm Per Year 2012-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Beaufort County

For the 2012-2019 period, there was average of one-half day of winter weather per year across the county. Some notable events include:

- January 28, 2014: A strong cold air pushed temperatures to around freezing across the county. Ice was accumulated up to one quarter of an inch at various locations. Bridges to Hilton Head Island were impassable due to ice on the morning of January 29, 2014.
- February 12, 2014: A major ice storm occurred with one to three quarters of an inch of ice accumulation. Numerous large tree limbs were down due to ice around Sheldon.

City of Beaufort

- December 29, 2017: A peak storm totaled ice accumulation of less than one inch on elevated surfaces such as trees and roadway signs.

Town of Bluffton

- January 3, 2018: Following the storm, very cold air persisted across the region allowing snow to stay on the ground and on area roadways. There was a report of 4 inches of snow near the Town.

Town of Hilton Head Island

- January 28, 2014: A strong cold air pushed temperatures to around freezing across the town. Ice was accumulated up to one quarter of an inch.
- January 3, 2018: Following the storm, very cold air persisted across the region allowing snow to stay on the ground and on area roadways. The highest amount measured was four and one-half inches.

Town of Port Royal

- January 28, 2014: A strong cold air pushed temperatures to around freezing across the town. Ice was accumulated up to one quarter of an inch.

Colleton County

There were four winter storm evets across the county between 2012-2019. Some notable events include:

- January 28, 2014: Storm totaled ice accumulations ranged up to one inch in isolated locations with one quarter to three quarters of an inch more prevalent. The ice accumulations resulted in numerous trees down across many portions of the county as well as associated power outages.
- January 3, 2018: Following the storm, very cold air persisted across the region allowing snow to stay on the ground and on area roadways. An estimated four to five inches of snow was reported across coastal portions of Colleton County, including five inches measured in Bennetts Point.

Town of Cottageville

- January 3, 2018: Storm totaled snowfall ranged from four to five inches around Cottageville.