3.10: Other Significant Hazards

As noted in **Section 3.1.6**, this State Plan also considers risks identified outside of the process used in selecting hazards for analysis. **Section 5**, Coordination of Local Mitigation Planning, covers in detail hazards identified and addressed in all local plans.

Continuing with the process established during the last plan update, the Hazard Mitigation Council chose not to select and rank severe storms which include thunderstorms, lightning, hail, and high wind events. This category of hazard does not typically cause an impact requiring a state response and would typically be mitigated at the local level. However, during a review of the plan, and the fact that 97% of local jurisdictions indicated severe weather (thunderstorms, lightning, hail, high wind) were of significant concern, the state opted to expand the hazard profile and assessment in this section. A general discussion of vulnerability, histories of events, and calculations of probabilities are included for thunderstorms, wind, lightning, and hail, which are all captured under Severe Weather. Property damage, loss of life, and injuries expected statewide on an annual basis are also addressed. It was not possible to specifically address expected losses to critical facilities or state-owned facilities with the limited data available.

It was determined that hazards initially ranked and identified by over 45 percent or fewer of local jurisdictions as hazards of concern do not pose a significant state-level threat to Mississippi. Those hazards are illustrated in **Table 3.13.1** below:

Table 3.13.1
Hazards Identified by Jurisdictions in Local Plans

Hazard Type	No. of Jurisdictions Profiling Hazard	Percent of Plans
Severe Weather (thunderstorms, lightning, hail, high wind)	115	97%
Expansive Soils	84	71%
Extreme Heat	61	51%
Coastal Erosion	0	0%
Erosion	60	50%
Land Subsidence	46	39%
Tsunami	3	2%
Storm Surge	6	5%
Sea Level Rise/Climate Change	6	5%

As noted earlier in the chapter, hazards identified and addressed in local plans, but not included in this plan, will receive the support of the state mitigation program. Examples of state support of local hazard mitigation plans are the severe weather siren and saferoom programs. These mitigation programs address multiple hazards by alerting the public and providing shelter from tornadoes and the types of events described in this Section.

Severe Storms

Hazard Description

Severe storms caused by cold fronts and daytime heating of the atmosphere can occur at any time in Mississippi. These storms have the potential to produce tornadoes, high winds, lightning, hail, and heavy rain. This Section focuses on the most common of these occurrences including thunderstorms, high (straight-line) wind events, hail, and lightning.

Thunderstorms are defined by the National Weather Service (NWS) as local storms (accompanied by lightning and thunder) produced by a cumulonimbus cloud, often accompanied by gusty winds, heavy rain, and hail. Non-severe thunderstorms rarely extend over two hours. The NWS considers a thunderstorm severe if it produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado. Severe thunderstorms are distinguished by stronger winds and heavier rain than normal thunderstorms. Severe storms have the potential to produce damaging hail, spawn tornadoes, and initiate flash flooding. Thunderstorms may occur as single systems, in clusters, or as straight-line formations. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time.

High winds are associated with sustained or gusting winds of significant strength to cause risk or damage to crops, vegetation, buildings, or infrastructure. High winds are typically associated with weather frontal systems and are often associated with other severe weather events, such as hail and lightning.

High winds can damage property by carrying projectile debris or breaking building envelopes as the wind buffets weak points around doors, windows, and roof structures. Wind speed can increase as it passes between closely situated buildings through a Venturi effect increasing the potential for damage.

The National Weather Service recognizes and defines three levels of wind events:

- Wind Advisory – Sustained winds of 30 mph or more or gusts of 45 mph or greater for one hour or longer.
- High Winds – Sustained winds of 40 mph or greater for at least one hour, or frequent gusts of wind of 58 mph or greater.
- Extreme Wind Warnings – Sustained winds of 115 mph or greater during a land-falling hurricane.

Winds and related damages can also be defined through the Beaufort Wind Scale as shown in **Table 3.13.2.** Damaging wind events in the State of Mississippi typically occur as tornadoes, straight-line wind events, and severe thunderstorms. Depending on the type of wind event, the damage sustained can range from extremely localized to widespread and from moderate to devastating. The potential impacts of a severe wind event depend on the specific characteristics of the storm but can include broken tree branches and uprooted trees; downed power, cable, and telephone lines; damaged radio, television, and communication towers; damaged and torn-off roofs; blown out walls and garage doors; overturned vehicles; destroyed homes and businesses; and serious injury and fatalities. Downed trees and power lines can fall across roadways, block key access routes, and often result in extended power outages.

Table 3.13.2
Beaufort Wind Scale

Force	Wind (Knots)	WMO Classification	Wind Effects On Water	On Land
0	Less than 1	Calm	Sea surface is smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind is felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaves begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps, waves 13-19 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against the wind
8	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	91-47	Strong Gale	High waves (23-32 ft), the sea begins to roll, dense streaks of foam, and spray may reduce visibility	Slight structural damage occurs, stale blows off roofs
10	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees are broken or uprooted, “considerable structural damage”
11	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover the sea, and visibility becomes more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white and driving spray, visibility greatly reduced	

Lightning is a visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, or between a cloud and the ground. Lightning is created by static electrical energy and can generate enough electricity to set buildings on fire and electrocute people.

Lightning can strike anywhere and anytime thunderstorms are in the area. Almost all lightning occurs within 10 miles of the parent thunderstorm, but in rare cases, it can strike as much as 50 miles away. There are two major categories of lightning:

- Cloud Flashes – Cloud flashes sometimes have visible channels extending into the air around the storm but not striking the ground. This is further defined as cloud-to-air, cloud-to-cloud, or intra-cloud lightning.
- Ground Flashes – Lightning channels that travel from cloud to ground or ground to cloud. There are two categories of ground flashes: natural and artificially initiated/triggered. Artificially initiated lightning includes strikes on tall structures, airplanes, rockets, and towers on mountains. Artificially initiated lightning travels from the ground to a cloud while natural lightning travels from cloud to ground.

Hail is defined by the National Weather Service (NWS) as showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud. NWS Studies of thunderstorms indicate two conditions are required for hail to develop: sufficiently strong and persistent up-draft velocities and an accumulation of liquid water in a super-cooled state in the upper parts of the storm. Hailstones are formed as water vapor in the warm surface layer rises quickly into the cold upper atmosphere. The water vapor is frozen and begins to fall; as the water falls, it accumulates more water vapor. This cycle continues until there is too much weight for the updraft to support and the frozen water falls too quickly to the ground to melt along the way.

The size of hailstones is best determined by measuring their diameter with a ruler. In the absence of a ruler, hailstone size is often visually estimated by comparing its size to known objects. **Table 3.13.3** provides a reference of commonly used objects for this purpose.

Table 3.13.3
Hail Size Chart

Hail Diameter Size	Description	Hail Diameter Size	Description
¼"	Pea	1 ¾"	Golf Ball
½"	Marble	2"	Hen Egg
¾"	Penny	2 ½"	Tennis Ball
7/8"	Nickel	2 3/4 "	Baseball
1" (severe)	Quarter	3"	Large Apple
1 ¼"	Half Dollar	4"	Softball
1 ½"	Ping Pong Ball/Walnut	4 ½"	Grapefruit

Source: National Weather Service

Location and Extent

While severe storm events are typically isolated to relatively small areas, historical records indicate that the entire state is vulnerable to severe thunderstorms. Trends in the data do not indicate if portions of the state are more vulnerable than others. Based on available data during this update process, the Hazard Mitigation Council draws the same conclusion - every county is vulnerable.

To demonstrate the extent and location of severe wind and hail, **Figures 3.13.1** and **3.13.2** reflect the location of historic events (2000 to 2023). A summary of historic occurrences and the probability of future impacts is also presented.

Figure 3.13.1
Severe Winds

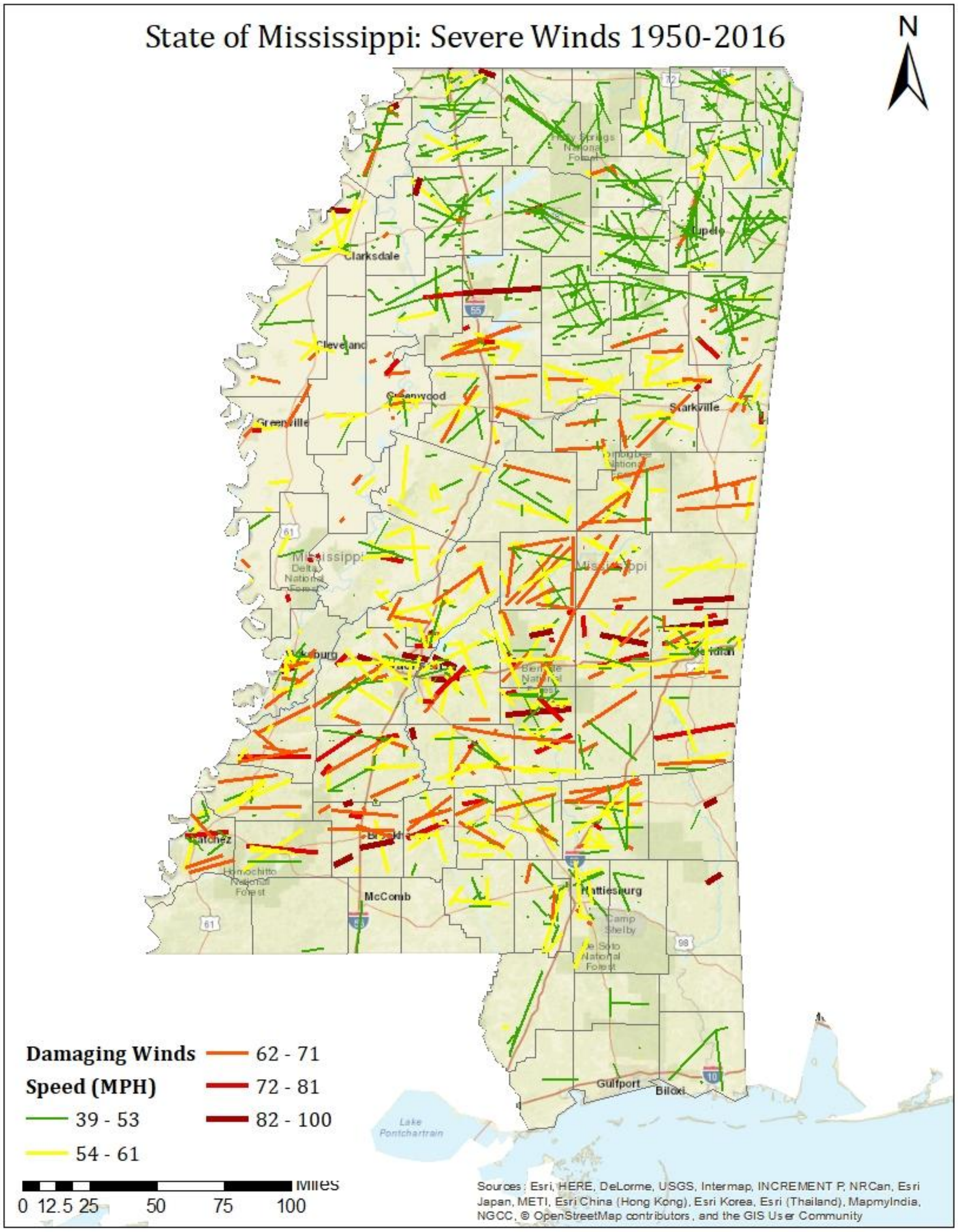
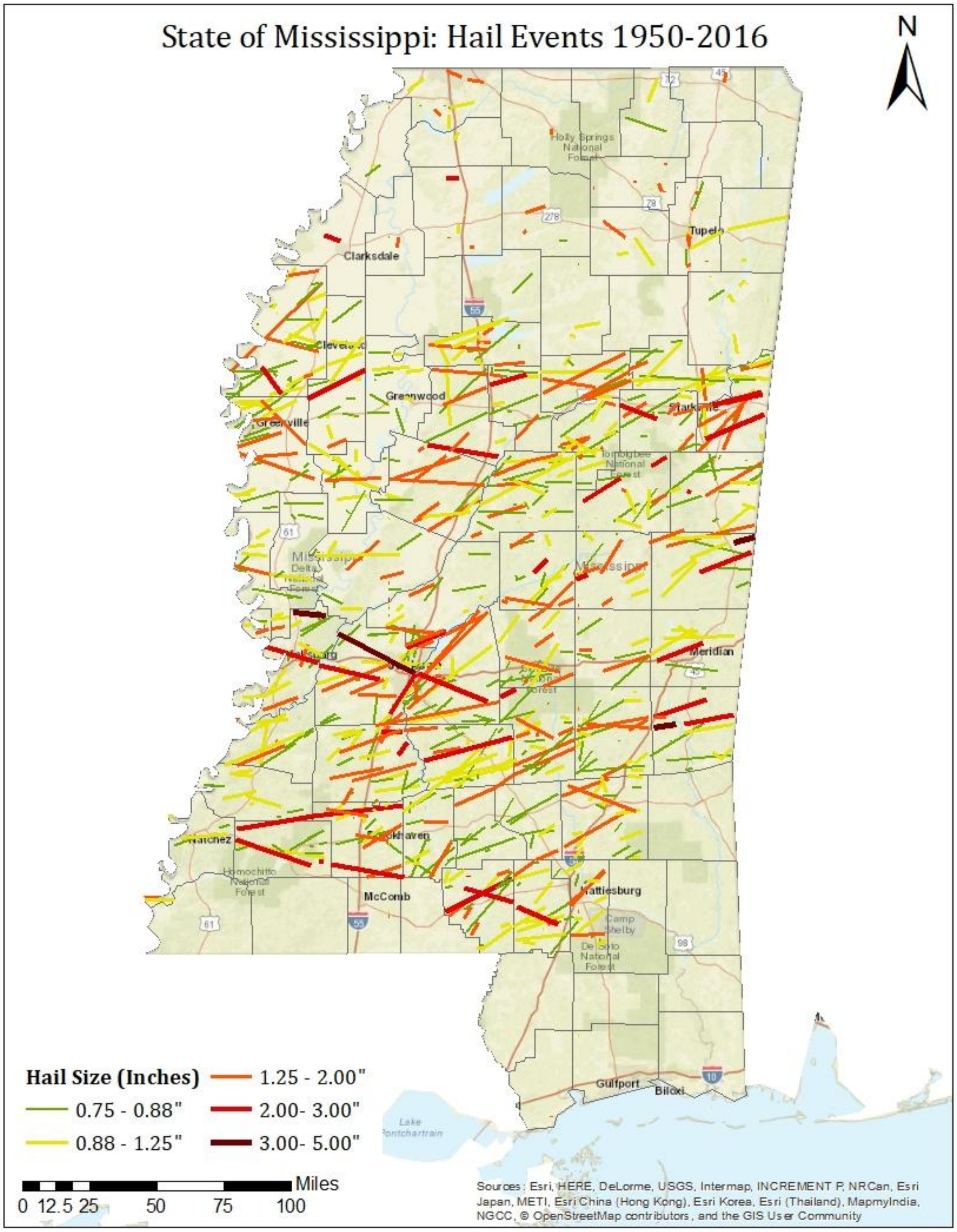


Figure 3.13.2
Hail



Previous Occurrences

High Wind, Thunderstorm Winds, and Strong Wind Events

High winds, thunderstorm winds, and strong winds are geographically undefined. Every year these events have the potential to occur in all Mississippi counties. The specific number of events and their corresponding effects are recorded in the NCDC database. Events from the past 15 years are presented. Based on the sheer number of incidences, each county is susceptible to winds of any type. It is still the assertion of the Hazard Mitigation Council that mitigation activities should be identified at the local planning level. It is important to note that the three categories of winds are profiled in **Tables 3.13.2, through 3.13.4**.

Table 3.13.2
High Wind Events 2002 – 2023

Year	No. of Events	No. of Counties Affected	Death	Injury	Property Damage ($)	Crop Damage ($)
2023	21	21	0	0	$182,000	$0
2022	1	1	0	0	$0	$0
2021	0	0	0	0	$0	$0
2020	0	0	0	0	$0	$0
2019	0	0	0	0	$0	$0
2018	0	0	0	0	$0	$0
2017	4	4	0	0	$50,000	$0
2016	0	0	0	0	$0	$0
2015	0	0	0	0	$0	$0
2014	0	0	0	0	$0	$0
2013	3	2	0	0	$30,000	$0
2012	0	0	0	0	$0	$0
2011	8	8	0	0	$500,000	$485,000
2010	0	0	0	0	$0	$0
2009	15	15	0	0	$490,000	$0
2008	23	23	0	0	$1,074,000	$0
2007	0	0	0	0	$0	$0
2006	0	0	0	0	$0	$0
2005	0	0	0	0	$0	$0
2004	0	0	0	0	$0	$0
2003	0	0	0	0	$0	$0
2002	20	19	0	0	$115,000	$0
Totals	**95**		**0**	**0**	**$2,441,000**	**$485,000**

Source: NCDC 2023

Table 3.13.3
Thunderstorm Wind Events 2002 – 2023

Year	No. of Events	No. of Counties Affected	Death	Injury	Property Damage ($)	Crop Damage ($)
2023 Through June	46	22	0	2	$492,850	0
2022	543	79	0	8	$5,220,800	$32,000
2021	395	78	3	2	$7,138,600	$0
2020	550	79	2	6	$7,640,000	$1,000
2019	530	74	2	5	$5,790,000	$0
2018	537	78	0	4	$8,029,600	$0
2017	437	75	1	0	$8,686,000	$0
2016	473	73	0	3	$6,579,000	$0
2015	362	69	1	1	$2,662,000	$0
2014	424	74	1	7	$5,859,000	$0
2013	261	75	0	5	$4,394,000	$0
2012	518	74	1	12	$6,437,000	$0
2011	697	81	4	5	$20,272,000	$356,000
2010	489	74	0	0	$5,898,000	$106,000
2009	519	78	2	6	$11,721,025	$2,303,000
2008	829	79	0	5	$104,354,000	$9,698,000
2007	416	78	0	2	$7,050,000	$480,000
2006	403	76	0	10	$46,968,000	$30,000
2005	411	75	1	7	$19,445,000	$1,280,000
2004	420	78	1	9	$3,330,000	$0
2003	552	77	0	0	$12,059,050	$0
2002	414	75	0	0	$11,115,000	$0
Totals	**7,625**		**12**	**72**	**$276,829,075**	**$14,253,000**

Source: NCDC 2023

Table 3.13.4
Strong Wind Events 2002 – 2023

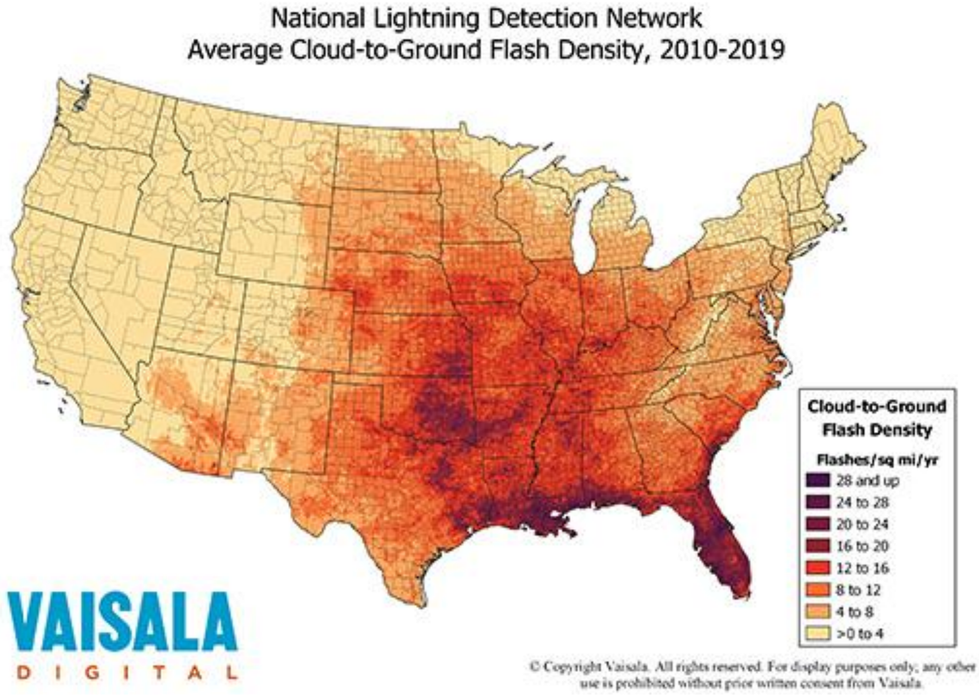
Year	No. of Events	No. of Counties Affected	Death	Injury	Property Damage ($)	Crop Damage ($)
2022	22	19	0	0	$138,200	$2000
2021	5	5	0	0	$12,000	$0
2020	17	15	0	0	$235,000	$0
2019	25	17	1	0	$517,000	$0
2018	9	7	0	0	$117,000	$0
2017	33	4	0	1	$617,000	$0
2016	17	13	0	0	$3,000	$0
2015	46	22	0	0	$365,600	$0
2014	14	11	0	0	$184,500	$0
2013	16	13	0	0	$108,500	$0
2012	40	23	1	0	$1,066,000	$0
2011	21	15	0	0	$144,000	$0
2010	15	12	0	0	$127,000	$0
2009	31	27	0	0	$985,200	$0
2008	29	21	0	0	$1,036,000	$200
2007	19	16	0	0	$179,110	$0
2006	18	14	0	0	$253,600	$0
2005	0	0	0	0	$17,000	$0
2004	4	3	0	0	$0	$0
2003	4	4	0	0	$165,000	$0
2002	0	0	0	0	$0	$0
Totals	**385**		**2**	**1**	**$6,270,710**	**$2,200**

Source: NCDC 2023

Lightning

Lightning, once one of nature's most prevalent killers, is claiming far fewer lives in the United States, mostly because we have learned to get out of the way. More people are subscribing to, “When the thunder roars, get indoors.” According to NOAA, in the United States, an average of 27 people were killed each year by lightning over the last decade. People struck by lightning often report a variety of long-term and debilitating symptoms, including memory loss, attention deficit, sleep disorder, numbness, dizziness, stiffness in joints, irritability, fatigue, weakness, muscle spasms, depression, and an inability to sit for long periods.

Figure 3.13.4



Records found in the NCDC database (**Table 3.13.5**) indicate that 14 reported fatalities and 19 reported injuries in Mississippi were caused by lightning in the past 16 years (2010 to 2019). It should be noted not all lightning events are reported, therefore the context should be considered when applying further analysis. The main point is that each county is susceptible to lightning, and further analysis and mitigation activities should be identified at the local plan level. The table below provides a summary of the events from 2002 to 2022 and their impact.

Table 3.13.5
Lightning Events 2002 – 2022

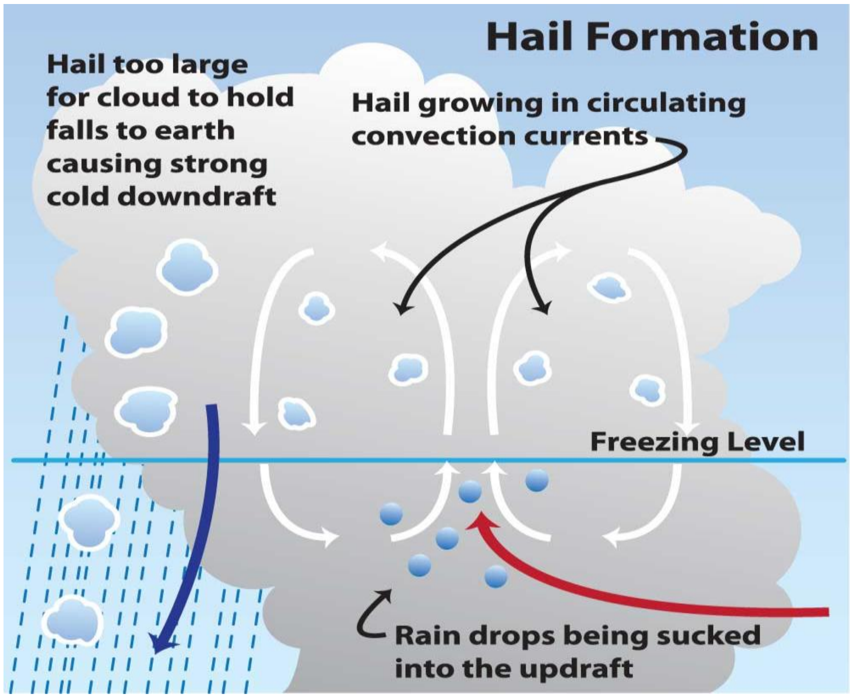
Year	No. of Events	No. of Counties Affected	Death	Injury	Property Damage ($)	Crop Damage ($)
2022	7	5	0	0	$541,000	$0
2021	6	6	0	7	$140,000	$0
2020	5	4	0	0	$123,000	$0
2019	10	8	0	0	$315,000	$0
2018	18	12	0	4	$1,221,000	$0
2017	8	7	0	2	$550,000	$0
2016	15	11	3	1	$942,000	$0
2015	13	11	0	0	$648,600	$0
2014	8	8	1	0	$220,000	$0
2013	9	8	0	0	$334,000	$0
2012	26	14	0	1	$1,943,000	$0
2011	24	18	1	2	$1,403,000	$0
2010	17	13	0	1	$1,849,000	$0
2009	15	11	1	3	$254,000	$0
2008	24	17	1	1	$990,000	$7,000
2007	13	12	0	0	$975,000	$0
2006	20	14	2	4	$1,080,000	$2,000
2005	21	16	2	0	$4,696,000	$0
2004	12	11	1	3	$145,000	$0
2003	12	8	0	1	$388,000	$0
2002	16	12	2	0	$115,250	$0
Totals	**299**		**14**	**30**	**$18,872,850**	**$9,000**

Source: NCDC 2023

Hail

Many strong severe storms produce hail, with more frequent hailstorms occurring in the late spring and early summer. Hail forms when thunderstorm updrafts are strong enough to carry water droplets well above the freezing level. This freezing process forms a hailstone, which can grow as additional water freezes onto it. Eventually, the hailstone becomes too heavy for the updrafts to support it and it falls to the ground. **Figure 3.13.5** illustrates how hail is formed.

Figure 3.13.6
Hail Formation



Source: NASA

Large hail has the potential to cause serious injury. Hail can be smaller than a pea and as large as a softball. Larger hailstones can cause significant damage to vehicles, glass surfaces (*e.g.* skylights and windows), roofs, plants, and crops. The size of hailstones is a direct result of the severity and size of the storm. The land area affected by individual hailstorms is not much smaller than a parent thunderstorm, an average of 15 miles in diameter around the center of a storm.

Hail measuring between 0.75 and 1 inch in diameter is the most common occurrence. There were a few incidences where hail reached 2 and 2.75 inches in diameter. Thousands of hail incidents have been reported since 1950 according to the NCDC and as shown in **Figure 3.13.2**. Not all hail events are reported so the context should be considered when applying further analysis. All of Mississippi's counties are susceptible to hail, and further analysis and mitigation activities should be identified at the local plan level. A summary of the events from 2002 to 2023 as reported to the NCDC and their impacts is listed in **Table 3.13.5**.

Table 3.13.5
Hail Events 2002 – 2023

Year	No. of Events	No. of Counties Affected	Death	Injury	Property Damage ($)	Crop Damage ($)
2023-June	12	9	0	0	$3,000	0
2022	142	55	0	0	$37,167,500	$7,000
2021	82	40	0	0	$509,000	$0
2020	108	47	0	0	$2,859,000	$0
2019	65	39	0	0	$228,000	$0
2018	82	45	0	0	$319,000	$10,000
2017	128	53	0	0	$634,000	$0
2016	209	66	0	0	$404,800	$0
2015	93	29	0	0	$101,600	$0
2014	183	65	0	0	$2,469,000	$0
2013	146	61	0	1	$557,019,000	$0
2012	202	63	0	0	$812,500	$0
2011	368	74	0	1	$3,050,000	$0
2010	290	67	0	0	$1,354,000	$50,000
2009	323	76	0	0	$157,000	$4,000
2008	469	78	0	0	$2,014,000	$0
2007	223	74	0	0	$321,250	$80,000
2006	344	78	0	0	$17,767,000	$6,600,000
2005	447	75	0	2	$29,743,000	$600,000
2004	153	59	0	0	$41,750	$0
2003	363	76	0	0	$3,423,000	$0
2002	136	61	0	0	$230,440	$0
Totals	**4,568**		**0**	**4**	**$660,627,840**	**$7,351,000**

Source: NCDC 2023

Severe Storm Vulnerability

Typically, damage associated with these hazards includes structural fires, broken glass, damaged vehicles or siding, personal injuries, and fatalities. Wind damages typically include broken branches, uprooted trees, damaged roofs, structural damage, and destruction of small structures.

People, buildings, and property are at risk from the effects of high winds and lightning. Buildings, automobiles, and infrastructural components (such as electrical feed lines) can suffer damage from high wind and lightning; outdoor populations are vulnerable to injury or death from lightning. High winds can cause debris to strike people, animals, buildings, and property, which may result in significant injuries, fatalities, and property damage.

Critical infrastructure associated with power transmission, telecommunications, and road signage is vulnerable to hail. Older manufactured homes are particularly susceptible to hail events due to construction methods (vinyl siding, lesser gauge metal roofs). People and animals have the potential to be impacted by hail if they are caught outdoors with no protection.

Although no specific areas of the state have a higher risk of being affected by severe storms than others, several factors contribute to a particular area's vulnerability to damage. Certain characteristics of an area or a structure, increase its resistance to damage from high wind events, lightning, and hail. Many of these factors are specific to the location or the structure in question. More densely populated areas may experience more damage from hail, whereas more rural areas are potentially more vulnerable to fire from lightning because of longer response times for fire suppression. For these reasons, the State of Mississippi feels it is important to include these hazards in local mitigation plans, as they are most effectively mitigated at that level.

Coastal/Beach Erosion

Hazard Description

As defined by NOAA, coastal erosion is a process whereby large storms, flooding, strong wave action, sea level rise, and human activities, such as inappropriate land use, alterations, and shore protection structures, erode the beaches and bluffs along the U.S. coasts. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences.

In the U.S., coastal erosion is responsible for roughly $500 million per year in coastal property loss, including damage to structures and loss of land. To mitigate coastal erosion, the federal government spends an average of $150 million every year on beach nourishment and other shoreline erosion control measures.[1] In addition to beach erosion, more than 80,000 acres of coastal wetlands are lost annually—the equivalent of seven football fields disappearing every hour of every day. The aggregate result is that the United States lost an area of wetlands larger than the state of Rhode Island between 1998 and 2009.[3]

While coastal erosion affects all regions of the United States, erosion rates and potential impacts are highly localized. Average coastline recession rates of 25 feet per year are not uncommon on some barrier islands in the southeast. In a single event, severe storms can remove even wider beaches. In undeveloped areas, these high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion may be considered catastrophic.

The Gulf of Mexico is impacted by the development of oil, gas, and mineral resources. The Gulf accounts for over 95% of the U.S.'s outer continental shelf oil and gas production, and processes over two-thirds of the nation's oil imports. Invasive species are a serious threat to native biota in many gulf coast ecosystems, and aquatic nuisance species pose severe economic problems; interfering with transportation, energy production, reservoir capacity, and recreational uses. The effect of oil breaches on coastal erosion is determined by how much oil reaches the coastal regions and how long it remains. Oiled plants can die, along with roots that bind and stabilize the soil, leading to erosion.

Location and Extent

The issue of beach erosion applies to three counties in Mississippi: Hancock, Harrison, and Jackson. Each of these counties had comprehensive beach maintenance and protection programs in place for many years.

These programs utilized locally budgeted funds and were occasionally supplemented with state and federal funds. Hurricane Katrina damaged many of the beaches as well as the beach protection facilities.

Researchers from the USGS Woods Hole Coastal and Marine Science Center are studying the influence of wave action and sediment supply on wetland vulnerability and ecosystems. Over 6.5 months, the group developed a time-lapse video showing lateral erosion of a salt marsh in the Grand Bay National Estuarian Reserve, which is part of an embayment near the City of Pascagoula. The results were 1.5 meters of erosion from wave action, which is a rate of more than three meters, or ten feet, per year.[2]

The United States Army Corps of Engineers completed an investigative report identifying major restoration and mitigation projects. This project received a supplemental appropriation for implementation and is being tracked as Mississippi Mitigation Action – Hurricane 6, USACOE Mississippi Coastal Improvements Program. The Mississippi Department of Marine Resources serves as the lead agency for beach erosion initiatives and is represented on the State Hazard Mitigation Council.

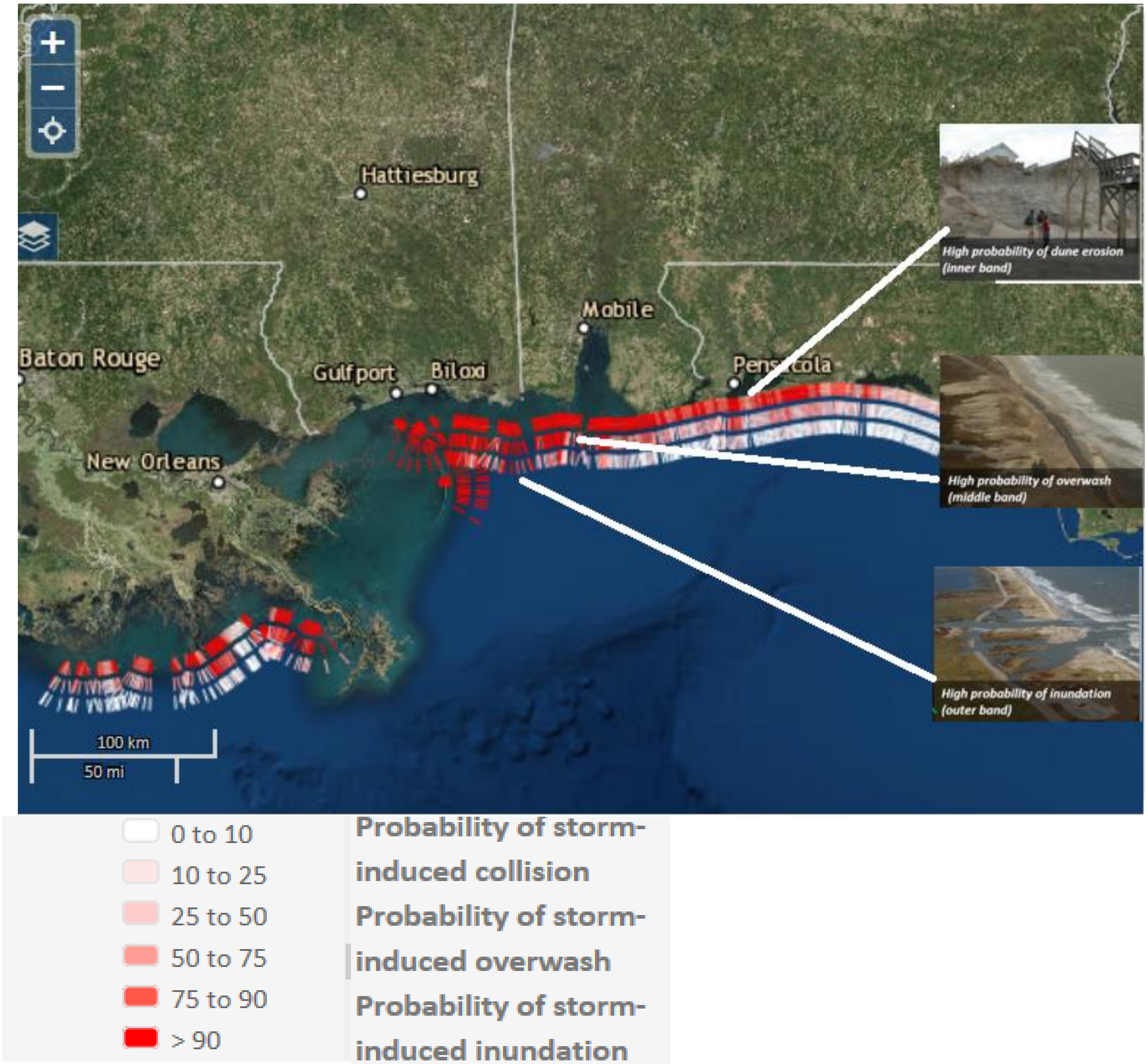
The Mississippi Department of Marine Resources (DMR) Coastal Preserves Program was developed in 1992 by the authority of the Wetlands Protection Act. The Coastal Preserves Programs' objective is to acquire, protect, and manage sensitive coastal wetland habitats along the Mississippi Gulf Coast, therefore ensuring the ecological health of Mississippi's coastal wetland ecosystems. The state currently has title to approximately 30,000 acres of the designated 72,000 acres of crucial coastal wetland habitat within Mississippi's 20 coastal preserve sites.

Probability of Future Occurrences

The USGS National Assessment of Coastal Change Hazards provides an interactive map that displays hurricane-induced coastal erosion hazards for sandy beaches along the U.S. Gulf of Mexico and Atlantic (Florida to New York) coastlines. The analysis is based on a storm-impact scaling model that uses observations of beach morphology combined with sophisticated hydrodynamic models to predict how the coast will respond to the direct landfall of category 1-5 hurricanes. Hurricane-induced water levels resulting from both surge and waves are compared to beach and dune elevations to determine the probabilities of three types of coastal change: collision (dune erosion), overwash, and inundation.

Probabilities of coastal erosion hazards are based on estimating the likelihood that the beach system will experience erosion and deposition patterns consistent with collision, overwash, or inundation regimes. The regimes are calculated by using values of dune morphology and mean and extreme water levels for each 1-kilometer section, such that the probability of collision occurs when extreme water levels reach the dune toe; overwash when extreme water levels reach the dune crest; and inundation when mean water levels reach the dune crest. Sections with no dune toe (berms instead of dunes) do not have a defined probability of collision.

Figure 3.13.4
Hurricane Nate Assessment of Potential Coast Change Impacts- 2017
(Source: USGS)



Comparing the 12-month forecast from the 2013 plan to the Hurricane Nate coast change impacts from 2017, there is a noticeable increase in collision, overwash, and inundation along the Gulf Coast.

Source: **John Fitzhugh** jcfitzhugh@sunherald.com

A family walks Thursday, June 22, 2017, on the boardwalk near Hewes Avenue in Gulfport where the beach has eroded to the seawall. A project to replenish the beach in Harrison County will start in October.

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[1] U.S. Climate Resilience Toolkit. Retrieved 04.27.18 from, https://toolkit.climate.gov/topics/coastal-flood-risk/coastal-erosion

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