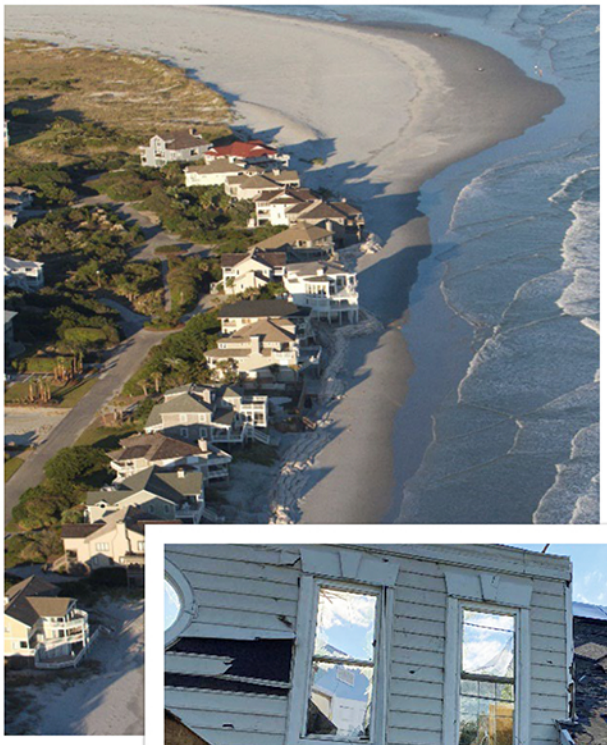
2023 Delaware Hazard Mitigation Plan



AUGUST 2023

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Executive Summary

The strength and occurrence of hazards cannot be prevented, but we can save lives and reduce property damage by understanding the risks and taking action to address those risks. In the process, we can increase resilience in our community, environment, and economy. The State of Delaware is dedicated to the protection of local residents, their property, and to the improvement of the quality of life for all.

Mitigation has been defined as “sustained action to reduce or eliminate long-term risk to human life and property from natural, human-caused, and technological hazards.” It is fundamentally a loss-prevention function characterized by planned, long-term alteration of the built environment to ensure resilience against natural and human-caused hazards. Mitigation should form the foundation of every emergency management agency’s plans and procedures. Emergency management agencies should adopt mitigation practices to reduce, minimize, or eliminate hazards in their community.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health and enhancing recreational opportunities. Mitigation planning benefits include:

- Saving lives and property;
- Saving money;
- Speeding recovery following disasters;
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and
- Demonstrating a firm commitment to improving community health and safety.

Success in a 21st-century economy requires serious, sustained leadership on infrastructure and asset investment at all levels of government. Delaying these investments only escalates the cost and risks of an aging infrastructure system, an option that the country, Delaware, and families can no longer afford.

The Delaware State Hazard Mitigation Plan identifies potential hazards, vulnerabilities to these hazards, and mitigation strategies to reduce future damages. The plan fulfills the requirements of the Federal Disaster Mitigation Act as administered by the Delaware Emergency Management Agency (DEMA) and the Federal Emergency Management Agency (FEMA). Emphasis has been placed on the identification and prioritization of possible mitigation actions that will assist Delaware in becoming less vulnerable to the damaging forces of natural and non-natural hazards while improving the economic, social, and environmental health of the State.

This plan is not legally binding but, instead, is a tool for the State to use to become more resilient to hazards. Mitigation actions will be implemented as capabilities and funding allow.

Section 1: Introduction

1.1 Overview

The State of Delaware All-Hazard Mitigation Plan (SHMP) fulfills the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), which is administered by the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act provides federal assistance to state and local emergency management entities to mitigate the effects of disasters. The SHMP also encourages cooperation among various organizations across political subdivisions.

This SHMP is an update of the 2018 FEMA-approved SHMP. With each update, new challenges are identified, new strategies proposed, and when incorporated, the updated plan grows in complexity, but not necessarily in utility.

All participants involved in this planning process understand the benefits of developing and implementing mitigation plans and strategies. Elected officials, public safety organizations, planners, and many others have worked together to develop and implement this SHMP, displaying that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their communities.

There is also understanding that the State is not liable to completing the actions identified but will strive to implement the actions as funding, staffing, and time allows.

1.2 Purpose

This SHMP is intended to enhance and complement federal and state recommendations for the mitigation of hazards in the following ways:

- Protect life, safety and property by reducing the potential for future damages and economic losses that result from natural and man-caused hazards;
- Meet the requirements of the Disaster Mitigation Act of 2000, and therefore qualify for additional grant funding in both the pre-disaster and post-disaster environment;
- Speed up recovery and redevelopment following future disaster events;
- Demonstrate a firm local commitment to hazard mitigation principles; and
- Comply with both state and federal legislative requirements for local hazard mitigation plans.

The State is susceptible to a number of different hazards that have potential to cause property loss, loss of life, economic hardship, and threats to community lifelines and public health and safety. Occurrence of natural disasters cannot be prevented; however, their impact on people and property can be lessened through hazard mitigation measures.

Mitigation planning is imperative to lessen the impact of disasters in the State. This plan is an excellent method by which to organize the State's mitigation strategies. The implementation of the plan and its components is vital to preparing a community that is resilient to the effects of a disaster. The implementation of this SHMP can reduce loss of life and property and allow the State to operate with minimal disruption of vital services to residents. This SHMP provides a risk assessment of the hazards the State is exposed to and puts forth a mitigation strategy based on that risk assessment.

1.3 Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000, provides the legal basis for state, tribal, and local governments to undertake risk-based approaches to reducing natural hazard risks through mitigation planning.

Specifically, the Stafford Act requires state, tribal, and local governments to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance. The Stafford Act authorizes the following grant programs:

- Hazard Mitigation Grant Program (HMGP), which helps communities implement hazard mitigation measures following a Presidential major disaster declaration. This program also funds development and update of hazard mitigation plans.
- Building Resilient Infrastructure and Communities (BRIC) grant program, which give states, local communities, tribes and territories funding to address future risks to natural disasters, including ones involving wildfires, drought, hurricanes, earthquakes, extreme heat, and flooding.
- Pre-Disaster Mitigation Grant Program (PDM), which awards planning and project grants to assist states, territories, federally recognized tribes, and local communities in implementing sustained pre-disaster natural hazard mitigation programs. Such efforts may include development or update of hazard mitigation plans.
- Public Assistance Grant Program (PA), which provides assistance to state, tribal, and local governments, and certain types of private nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.
- Fire Management Assistance Grant Program (FMAG), which provides assistance to state, tribal, and local governments for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands that threaten such destruction as would constitute a major disaster.

Title 44, Chapter 1, Part 201 (44 CFR Part 201) of the Code of Federal Regulations (CFR) contains requirements and procedures to implement the hazard mitigation planning provisions of the Stafford Act.

The purpose of the Stafford Act, as amended by the Disaster Mitigation Act of 2000, is “to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters.” Chapter 322 of the act specifically addresses mitigation planning and requires state and local governments to prepare multi-hazard mitigation plans as a precondition for receiving FEMA mitigation grants.

The State Hazard Mitigation Plan was developed by the State Hazard Mitigation Council (Council) under the direction and guidance of IEM. The plan represents collective efforts of citizens, elected and appointed government officials, business leaders, non-profit organizations, and other stakeholders. This plan, and updating the plan, and timely future updates of this plan, will allow the State to comply with the Disaster Mitigation Act of 2000 and its implementation regulations, 44 CFR Part 201.4, thus resulting in eligibility to apply for federal aid for technical assistance and post-disaster hazard mitigation project funding. The update will also prioritize potential risks and vulnerabilities in an effort to minimize the effects of disasters across the state.

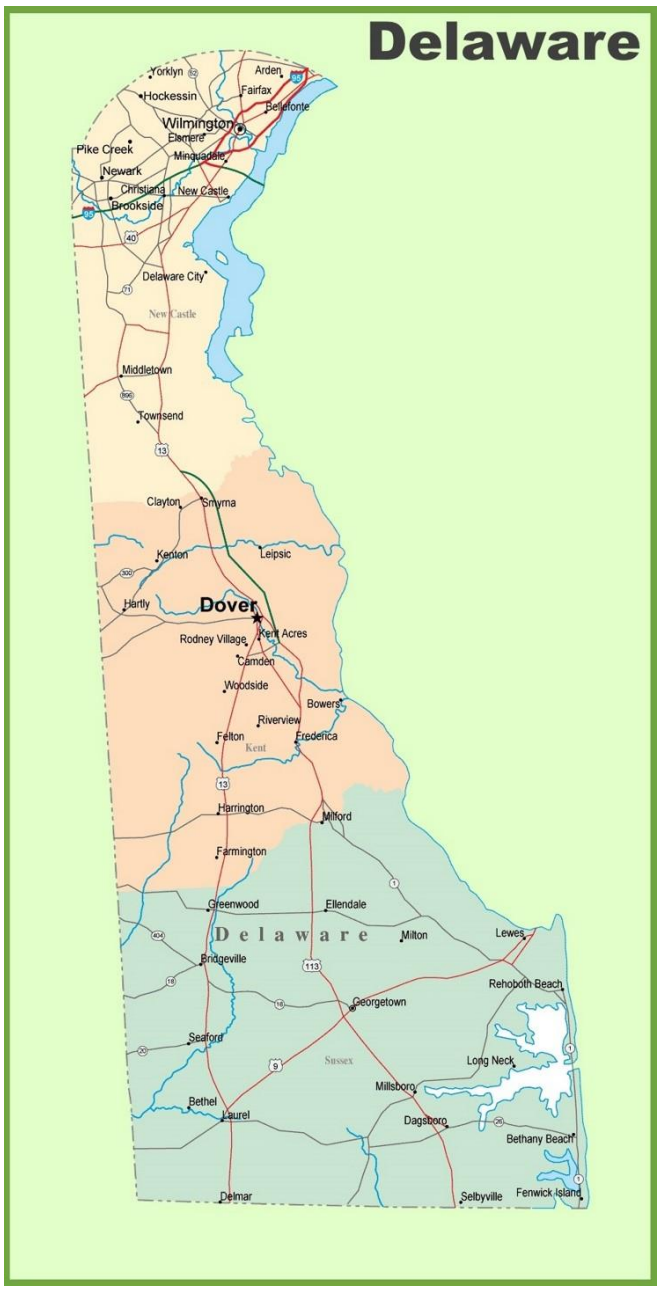


Figure 1: State of Delaware

1.4 Planning Area

The planning area for this plan is the State of Delaware in its entirety, which includes the counties of Kent, New Castle, and Sussex and the communities within.

Section 2: State Planning Process

2.1 Collaborative Process

The State of Delaware utilized the planning process guidance provided in the Federal Emergency Management Agency (FEMA) Comprehensive Preparedness Guide (CPG 101) to update the 2018 State Hazard Mitigation Plan (SHMP). An open public involvement process was established for federal, state, and local government agencies, neighboring state agencies, etc. to provide opportunities for everyone to be involved in the planning process.

Efforts to involve partners in the SHMP update included electronic invitations to attend meetings and serve on the Council, coordination with functional experts, obtaining progress or summary reports, conducting strategy meetings, and opportunities for input and comment on all draft deliverables.

2.1.1 Council

The State Hazard Mitigation Officer (SHMO), together with selected staff from state departments and partner agencies, form the core of the State Hazard Mitigation Council (Council). The Council involves members with climate change and climate adaptation expertise and state agencies with programs, policies, and assistance that support underserved communities, and organizations involved in local mitigation strategies. 2022 Council members are identified in the table below. For personnel who retire from Council during the life cycle of this plan update, the new staff member taking over that title will assume the roles and responsibilities of that title in the Council.

Table 1: 2022 State Hazard Mitigation Council (Council) Members

First Name	Last Name	Department	Division	Title
AJ	Schall	Department of Safety and Homeland Security (DSHS)	Delaware Emergency Management Agency (DEMA)	Director
Bob	Scarborough	Department of Natural Resources and Environment Control (DNREC)	Division of Water	Environmental Scientist V
Carlton	Hall	Department of State (DOS)	Historical and Cultural Affairs	Historical Preservation Specialist
Dan	Leathers	University of Delaware (UD)	Center for Environmental Monitoring Analysis	Delaware State Climatologist and Professor
Danielle	Swallow	University of Delaware (UD)	SeaGrant and Coastal Hazards	Coastal Resiliency Program Coordinator
Dave	Carpenter	New Castle County Public Safety	Emergency Management	Director
David	Edgell	Office of Management Budget (OMB)	Office of State Planning Coordination (OSPC)	State Planning Director

First Name	Last Name	Department	Division	Title
David	Warga	Department of Natural Resources and Environmental Control (DNREC)	Division of Watershed Stewardship	Environmental Scientist I/NFIP Coordinator
Janice	Shute	Department of Natural Resources and Environmental Control (DNREC)	Dam Safety	State Dam Safety Engineer
Jesse	Hayden	Department of Natural Resources and Environmental Control (DNREC)	Shoreline and Waterway Management	Environmental Program Administrator
Jim	Pappas	Delaware Department of Transportation (DelDOT)	Transportation Resiliency and Sustainability	Director
Joe	Thomas	Sussex County	Emergency Operations	Director
Joshua	Kelley	University of Delaware (UD)	Emergency Management	Associate Director
Karen	Horton	Delaware State Housing Authority (DSHA)	-	Planner IV
Kevin	Brinson	University of Delaware (UD)	Delaware Environmental Observing System	Director
Leanne	Vanderveer	Department of Safety and Homeland Security (DSHS)	Delaware Emergency Management Agency (DEMA)	Principal Planner
Lisa	Tanelian	Delaware Department of Agriculture (DDA)	-	Management Analysist
Malika	Davis	Delaware Public Service Commission (DEPSC)	-	Deputy Director
Marcia	Fox	Department of Natural Resources and Environmental Control (DNREC)	Division of Watershed Stewardship	Environmental Program Administrator
Marcia	Scott	University of Delaware (UD)	DE League of Local Governments	Director
Phillip	Cane	Department of Safety and	Delaware Emergency Management Agency (DEMA)	Planner IV/State Hazard Mitigation Officer (SHMO)

First Name	Last Name	Department	Division	Title
		Homeland Security (DSHS)		
Regina	Mitchell	Delaware Economic Development Authority (DEDA)		Director of Small Business
Stefanie	Baxter	University of Delaware (UD)	DE Geological Survey	Associate Scientist Geologist
Tim	Cooper	Department of Health and Social Services (DHSS)	Division of Public Health	Public Health Administrator I
Willie	Patrick	City of Wilmington (COW)	Office Emergency Management	Director

The role of the members during this planning process were to:

- Discuss the hazards, risks, vulnerabilities, capabilities, and possible mitigation actions that would be incorporated into this State Hazard Mitigation Plan Update.
- Contribute expertise, data, studies, information, etc. related to hazards.
- Provide a status report of previous action items.
- Provide general information requested by IEM.

2.1.2 Stakeholders

Stakeholders were invited to participate in the planning process, via email, and included agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, and neighboring communities.

Table 2: SHMP Stakeholders

Organization	Position
Pennsylvania Emergency Management Agency (PEMA)	SHMO State Hazard Mitigation Officer
Maryland Department of Emergency Management (MDEM)	SHMO State Hazard Mitigation Officer
Virginia Department of Emergency Management (VDEM)	SHMO State Hazard Mitigation Officer
FEMA Region 3	Planners
Environmental Protection Agency (EPA)	Sustainability Coordinator and Data Analyst
Delaware Dam Safety Program	State Dam Safety Engineer

The role of the stakeholders during this planning process were to:

- Discuss the hazards, risks, vulnerabilities, capabilities, and possible mitigation actions that would be incorporated into this State Hazard Mitigation Plan Update.
- Contribute expertise, data, studies, information, etc. related to hazards.
- Review the draft of the SHMP.

2.2 Existing Data and Plans

Existing hazard mitigation information and other relevant hazard mitigation plans were reviewed during the development of this plan. Data was gathered through numerous sources, including Geographic Information Systems (GIS). The intent of reviewing existing material was to identify existing data and information, shared objectives, and past and ongoing activities that can help inform the mitigation plan. It also helps identify the existing capabilities and planning mechanisms to implement the mitigation strategy. The table below outlines some of the sources used to collect data for the plan:

Table 3: Date Sources

Data Source	Data Incorporation	Purpose
Appraisal data, census data, land use data	Population and demographics	Risk Assessment
National Centers for Environmental Information (NCEI)	Hazard occurrences	Risk Assessment
Delaware Geological Survey (DGS)	Hazard occurrences	Risk Assessment
FirstMap	GIS information	Risk Assessment
Climate and Hazard Mitigation Planning (CHaMP) Tool	Previous event occurrences and damages	Risk Assessment
U.S. Army Corps of Engineers National Dam Inventory	Dam information	Risk Assessment
Delaware Dam Safety Program	Dam information	Risk Assessment
Association of Dam Safety Officials	Dam information	Risk Assessment
Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (DFIRM) Flood Zones, National Flood Insurance Program (NFIP) studies	Flood zone maps and NFIP information	GIS mapping of flood zones and NFIP data
October 2017 NFIP Flood Insurance Manual Change Package	NFIP Information	Repetitive Loss Properties and Community Rating System (CRS) ratings
2018 State Hazard Mitigation Plan	All sections	This is an update of that plan
Local Hazard Mitigation Plans	All sections	Incorporate local capabilities and risks
National Register of Historic Places	Historic districts	Risk Assessment
Parks & Wildlife List of Rare Species	Endangered or protected species	Risk Assessment
American Planning Association2022 Survey of State Planning Laws	State capabilities	Capability Assessment
Department resources	Hazard and asset data	Risk & Capability Assessments
FEMA Risk Rating 2.0	Hazard and asset data	Risk & Capability Assessments
National Risk Index	Hazard and asset data	Risk & Capability Assessments

During the planning process, an evaluation of other State planning efforts was conducted and concluded that all planning efforts will remain focused on the SHMP document. As other planning efforts arise in other state agencies and departments, the Council will provide a copy of the SHMP to the appropriate parties and recommend that all goals and strategies of planning documents are consistent with and support the goals of the SHMP and will not contribute to increased hazards.

2.3 Timeframe & Planning Meetings

The planning process for the update of the State Hazard Mitigation Plan was approximately five months. During the planning process, the State Hazard Mitigation Council met to discuss relevant information from the jurisdiction and to review objectives and progress of the plan. The goals of these meetings were to gather information and to provide guidance for the jurisdictions throughout the planning stages.

Table 4: Planning Timeframe

Activity	Time Period
Kickoff meeting	July 2022
Confirmed members of the Council	August 2022
Capability assessment	October 2022
Hazard identification & risk assessment	October 2022
Review of local risk assessment and mitigation actions	October 2022
Mitigation strategy (goals & action items)	October 2022
Review SHMP draft	March 2023
Update plan as needed	March 2023
Final draft review	April 2023
Send to FEMA/ make revisions as needed	April 2023
Adoption & signatures	Once “Approvable Pending Adoption” designation received.

Section 3: State Profile

3.1 Geography

Covering an area of 1,982 sq. mi, the State of Delaware is located in the Mid-Atlantic region of the United States. Delaware is bordered by the state of Maryland in the west and south; by Pennsylvania in the north, and by New Jersey in the east. It is also bordered by the Atlantic Ocean, Delaware Bay, and Delaware River in the southeast.

Most of the land of Delaware is very flat, averaging only 58 ft. above sea level, which is the lowest mean elevation among all the states of the Nation. The only significant exceptions are the rolling hills of the Piedmont Plateau that cover the northern edges of the state. Located at a point [Ebright Azimuth] just off Ebright Road in the New Castle County, to the south of the Pennsylvania border is Delaware's highest point – which rises to an elevation of only 448 ft (137m). The lowest point is the Atlantic Ocean (0m).

The state's eastern shorelines contain several bays, tidal creeks, and marshes. Its southern border with Delaware contains over 30,000 acres of swampland. Sandy beach fronts large stretches of the southern Delaware Bay and the Atlantic Ocean coastline. The most significant river is the Delaware River. Other rivers of note include the Mispillion, Murderkill, Pocomoke, Nanticoke, and St. Jones.

The Coastal Plain, covering much of Delaware, is a low-lying stretch of fertile land that borders the Atlantic Ocean. It's approximately 2,200 miles long, stretching from central New Jersey, south to Mexico's Yucatan Peninsula. The Chesapeake & Delaware Canal (mostly manmade) runs 14 miles long, 450 ft wide, and 35 ft deep across the states of Maryland and Delaware, connecting the Delaware River with the Chesapeake Bay. It's a modern sea-level, electronically controlled commercial waterway, carrying ship traffic east and west.

The Delmarva Peninsula occupies portions of the three U.S. states of Delaware, Maryland, and Virginia. It is bordered by the Chesapeake Bay on the west, and the Delaware River, Delaware Bay, and the Atlantic Ocean on the east. The peninsula's land is flat, with a few low-lying hills in the north.

The State of Delaware is divided into three (3) counties. In alphabetical order, these counties are Kent, New Castle, and Sussex.

With an area of 1,982 sq.mi, the State of Delaware is the 2nd smallest state amongst all the 50 states of the USA. Located in Kent County, along the St. Jones River, in the east-central part of the state is Dover – the capital city of Delaware. Situated in the New Castle County, along the confluence of the Christina River and the Delaware River is Wilmington – the largest and the most populous city in Delaware. It also serves as the chief port and the industrial, financial, and commercial center of Delaware. This information and more can be found in the World Atlas.

The State is situated in a transition zone between humid subtropical climate conditions to the south and humid continental conditions to the north. The moderating effects of the surrounding water bodies lessen temperature extremes compared to nearby interior locations. Even so, the State has a continental climate, with cold winter temperatures, hot summers and ample precipitation throughout the year. However, annual precipitation amounts can vary greatly from one year to another.

3.2 Climate

Delaware's climate is best described in the story maps created by the Center for Environmental Monitoring and Analysis (CEMA) at the University of Delaware. Delaware's temperatures are moderate, with mean annual temperatures across the State ranging from 54°F in northern New Castle County to 58°F along the Atlantic coast of southern Delaware.

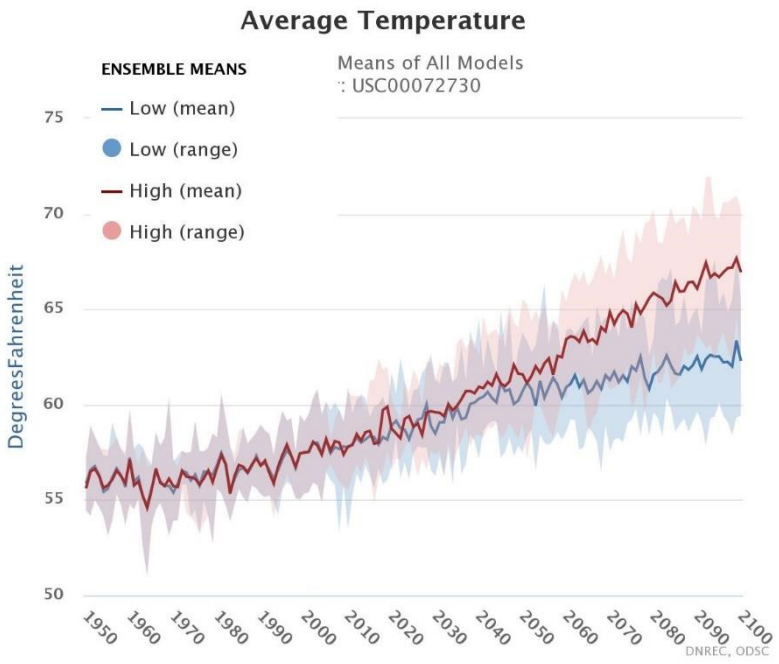


Figure 2: Delaware Average Temperature

Despite the moderate annual averages, Delaware's seasonal temperatures vary significantly. Winter can bring about sub-zero temperatures while the summers can produce sweltering conditions. These seasonal temperatures may be made more extreme over the next century due to the effects of climate change.

General climate projections demonstrate a rise in average temperature in Delaware. Affected by a rapidly changing climate and sea-level rise, Delaware faces potentially damaging and life-threatening conditions, such as an increase in the frequency of flooding that disproportionately impacts Delaware coastal communities.

Mean annual precipitation for Delaware is about 45 inches with large inter-annual variability.

Despite these severe weather events, Delaware's coastal location is one of the defining environmental attractions of the state, attracting many tourists to popular areas such as Rehoboth Beach or Cape Henlopen.

3.3 State Assets

The state profile consists of state assets that can be described very generally in the following five categories:

- People
- Economy
- Built environment
- Natural environment

Assets are defined broadly to include anything that is important to the character and function of a community and although all assets may be affected by hazards, some assets are more vulnerable because of their physical characteristics or socioeconomic uses. The purpose of an asset inventory is to identify specific vulnerable assets in the State. This inventory is included in **Section 4** of this SHMP.

Section 4: Risk & Vulnerability Assessment

The risk assessment provides the foundation for the rest of the mitigation planning process, which is focused on identifying and prioritizing actions to reduce risk to hazards. In addition, the risk assessment also can be used to establish emergency preparedness and response priorities, inform land use and comprehensive planning, and facilitate decision making by elected officials, city and county departments, businesses, and organizations in the community. Online resources used for this planning process included the following:

1. Climate Mapping for Resilience and Adaptation Tool
2. NCEI NOAA Storm Events Database
3. DGS
4. US Census
5. FEMA Declared Disasters
6. NFIP Community Status Book

Note: Historical data used in this SHMP planning process is from 2000 to 2023. The year 2000 was chosen as a starting point in order to provide a relatively large viewpoint of past hazard occurrences in Delaware. Data from 2000 also represents the presence of climate change, increasing populations, and change in infrastructure and assets. Information from years prior 2000 are tracked in previous versions of this State Hazard Mitigation Plan and can be provided upon request.

4.1 Major Disaster Declarations

The following table lists the major disaster declarations that have occurred in Delaware since 2000. More details on these disasters can be found on FEMA's Disaster Declaration website, https://www.fema.gov/disaster/declarations.

Table 5: Major Disaster Declarations 2000-Present

Event	Declaration Date	Type of Assistance	Declaration Number	Affected Counties
Severe Snowstorm	3/20/2003	Emergency Assistance	EM-3183	Kent, New Castle, Sussex
Hurricane Isabel	09/20/2003	Individual Assistance Public Assistance	DR-1494	Kent, New Castle
Tropical Storm Henri	09/23/2003	Individual Assistance Public Assistance	DR-1495	New Castle
Hurricane Jeanne	11/15/2004	Public Assistance	DR-1572	New Castle
Hurricane Katrina	9/30/2005	Public Assistance	EM-3263	Kent, New Castle, Sussex
Severe Flooding	7/5/2006	Public Assistance	DR-1654	Sussex
Severe Winter Storm	3/31/10	Public Assistance	DR-1896	Kent, New Castle, Sussex
Hurricane Irene	8/28/2011	Emergency Assistance	EM-3336	Kent, New Castle, Sussex
Hurricane Irene	9/30/2011	Public Assistance	DR-4037	Kent, Sussex
Hurricane Sandy	10/29/2012	Emergency Assistance	EM-3357	Kent, Sussex
Hurricane Sandy	11/16/2012	Public Assistance	DR-4090	Kent, Sussex
Severe Winter Storm	1/22/2016	Public Assistance	DR-4265	Sussex
Delaware Covid-19 Pandemic	04/05/2020	Individual Assistance Public Assistance	DR-4526	Kent, New Castle, Sussex
Delaware Tropical Storm Isaias	10/2/2020	Public Assistance	DR-4566	New Castle, Sussex
Delaware Remnants of Hurricane Ida	10/24/2021	Public Assistance	DR-4627	New Castle

4.2 Natural Hazard Profiles

Through a review of the 2018 SHMP, an assessment of previous federally declared disasters, historical events captured by NCEI and USGS, and a review of available local mitigation plans, the Council identified 12 natural hazards that could potentially impact the state within the next five years. Some hazards from the 2018 SHMP, such as nor'easters and extra-tropical storms, have been consolidated with other hazards due to the similarity of their threats and mitigation strategies. In alphabetical order, the natural hazards are:

1. Coastal Erosion
2. Coastal Flooding
3. Dam/Levee Failure Flooding
4. Drought
5. Earthquakes
6. Extreme Temperatures
7. Inland Flooding
8. Local Earth Movement
9. Severe Thunderstorms & Tornadoes
10. Severe Winter Weather
11. Tropical Cyclones
12. Wildfire & Smoldering Fires

A State Risk Assessment was conducted to review and characterize the impacts of these hazards on state assets and populations statewide, along with the likelihood of future events, the potential impact on lives and property, and the potential geographic location of the hazards. The following table reflects the results of the State Risk Assessment.

Table 6: Natural Hazard Risk Assessment Results

Hazard	Probability	Life Impact	Property Impact	Location	Maximum Intensity
Coastal Erosion	Highly Likely	Limited	Catastrophic	Minimal	Major
Coastal Flooding	Highly Likely	Limited	Catastrophic	Significant	Major
Dam/Levee Failure Flooding	Occasional	Limited	Catastrophic	Minimal	Major
Drought	Highly Likely	Limited	Catastrophic	Extensive	Major
Earthquakes	Occasional	Minor	Limited	Minimal	Weak
Extreme Temperatures	Highly Likely	Critical	Catastrophic	Extensive	Major
Inland Flooding	Highly Likely	Limited	Catastrophic	Extensive	Major
Local Earth Movement	Occasional	Minor	Limited	Minimal	Weak
Severe Thunderstorms & Tornadoes	Highly Likely	Catastrophic	Catastrophic	Extensive	Major
Severe Winter Weather	Highly Likely	Catastrophic	Catastrophic	Extensive	Major
Tropical Cyclones	Highly Likely	Catastrophic	Catastrophic	Extensive	Major
Wildfire & Smoldering Fires	Likely	Limited	Catastrophic	Minimal	Major

Assessment Level	Criteria
Probability of Future Events	
Unlikely	Recurrence interval of greater than every 100 years

Assessment Level	Criteria
Occasional	Recurrence interval of 11 to 100 years
Likely	Recurrence interval of 1 to 10 years
Highly Likely	Recurrence interval of less than 1 year
Potential Life Impact	
Minor	Very few injuries, if at all
Limited	Minor Injuries
Critical	Multiple deaths/injuries
Catastrophic	High number of deaths/injuries
Potential Property Impact	
Minor	Only minor property damage and minimal disruption of life and/or temporary shutdown of critical facilities
Limited	More than 10% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one day
Critical	More than 25% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one week
Catastrophic	More than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more
Potential Location	
Negligible	Less than 10 percent of State or isolated single-point occurrences
Minimal	10 to 25 percent of the State or limited single-point occurrences
Significant	26 to 74 percent of State or frequent single-point occurrences
Extensive	75 to 100 percent of State or consistent single-point occurrences
Maximum Probable Intensity	
Weak	Minor classification on the scientific scale, slow speed of onset or short duration of event, resulting in little to no damage
Moderate	Moderate classification on the scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days
Major	Major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months

Historical Overview

The National Centers for Environmental Information (NCEI) receives storm data from the National Weather Service (NWS) that is then compiled into a Storm Events Database. NWS receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, SkyWarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry, and the general public, among others. Please note that the National Weather Service does not guarantee the accuracy, validity, or completeness of the event data in the Storm Events Database. The data collected by NCEI is reflected in the following table.

Table 7: 2000-2022 Historical Overview

Hazard	Days	Impact			
		Property Damage	Crop Damage	Deaths	Injuries
Coastal Flooding	150	$ 50.812M	$ -	3	108
Drought	39	$ -	$ -	-	-
Extreme Temperatures	89	$ -	$ -	9	25
Inland Flooding	214	$ 23.730M	$ -	2	4
Severe Thunderstorms & Tornadoes	576	$ 25.276M	$ 501,000	1	18

Hazard	Days	Impact			
		Property Damage	Crop Damage	Deaths	Injuries
Severe Winter Weather	205	$ 13.300M	$ -	5	97
Tropical Cyclones	4	$ 17.750M	$ -	-	-
Wildfire & Smoldering Fires	14	$ 5,000	$ -	-	1
TOTAL	**859**	**$130.873M**	**$501,000**	**20**	**253**

NWS did not capture historical data for non-weather-related hazards, including coastal erosion, dam/levee failure flooding, earthquakes, and local earth movement. Delaware Geological Survey (DGS) recorded three (3) earthquakes between 2000-2022 but had no reported impacts. DNREC reported two (2) dam failure flooding events between 2000-2022 but had no reported impacts.

Probability of Future Events and Impacts

Past occurrences are important to review in order to establish a factual basis of hazard risk. It can be expected that future impacts and number of events will remain **consistent** with that of previous occurrences. However, the challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels, could significantly alter the types and magnitudes of hazards affecting states in the future. Because predicting future hazard events is inherently uncertain, current and relevant data were used to select the most appropriate methodologies to assess risks and vulnerability.

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a **rise** in scope, scale, and frequency of events on a yearly basis.

Disaster costs are predicted to remain the same or **increase** on a yearly basis as well. These costs include: physical damage to residential, commercial, and municipal buildings; material assets (content) within buildings; time element losses such as business interruption or loss of living quarters; damage to vehicles and boats; public assets including roads, bridges, levees; electrical infrastructure and offshore energy platforms; agricultural assets including crops, livestock, and commercial timber; and wildfire suppression costs, among others. However, these disaster costs do not consider losses to natural capital or environmental degradation; mental or physical healthcare related costs; the value of a statistical life (VSL); or supply chain, contingent business interruption costs. Therefore, our estimates should be considered conservative with respect to what is truly lost but cannot be completely measured due to a lack of consistently available data.

The increase in population and material wealth over the last several decades are an important cause for the rising costs. These trends are further complicated by the fact that much of the growth has taken place in vulnerable areas like coasts, the wildland urban interface, or river floodplains. Vulnerability is especially high where building codes are insufficient for reducing damage from extreme events.

To further profile individual hazards, hazard summaries were developed. The following sections are of these summaries, presented in **alphabetical order**.

4.2.1 Coastal Erosion

Table 8: Coastal Erosion Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Coastal Erosion	Highly Likely	Limited	Catastrophic	Minimal	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; impact of climate change; and the State's classification as a coastal zone,

- the probability of future coastal erosion is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of coastal erosion is **Limited** (minor injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by a coastal erosion occurrence is **Minimal** (10 to 25 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for coastal erosion is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

Coastal erosion is the process by which local sea level rise, strong wave action, and coastal flooding wear down or carry away rocks, soils, and/or sands along the coast. All coastlines are affected by storms and other natural events that cause erosion; the combination of storm surge at high tide with additional effects from strong waves—conditions commonly associated with landfalling tropical storms—creates the most damaging conditions. The extent and severity of the problem is worsening with global sea level rise.[1]

The coast of Delaware encompasses 381 miles of shoreline, including the 24 miles that front the Atlantic Ocean, with barrier beaches, inland bays, small islands, and highly productive estuaries, marshes, and tidal flats.

A February 1998 report written for DNREC estimates that Delaware's beaches experience on average between 2-4 feet of annual erosion. The beaches in the Fenwick, York, Bethany, Middlesex, and Sea Colony are the state's "hotspots" and all erode on average approximately four (4) feet per year. This approximate erosion rate is expected to continue.[2]

According to Delaware Coastal Management Program (DCMP) Section 309 Enhancement Program 2021-2025 Assessment and Strategy, Delaware has experienced relatively little coastal shoreline change in the past five years (2016-2020) as a result of development. This is primarily due to the State's Beach Preservation Act (7 Del. C. Ch 68) and its associated regulations, that minimize the impact of development to preserve the protective and recreational functions of beaches and dunes, and the State Coastal Zone Act (7 Del. C. Ch 70) and its associated regulations, that restrict industrial development within the coastal strip. Shoreline protection occurs principally in the form of beaches and dunes. Nourishment of the ocean beach is undertaken by the U.S. Army Corps of Engineers in coordination with DNREC. Maintenance activities of the Bay beaches, including the region from Pickering Beach south to Broadkill Beach, have been occurring as part of a 10-year management plan for the area and are primarily funded with state resources. Two notable shoreline management projects were completed during this assessment period.

[1] Coastal Erosion | U.S. Climate Resilience Toolkit
[2] State of the Beach/State Reports/DE/Beach Erosion - Beachapedia

Firstly, building on a DCMP-funded study, was the stabilization of the Mispillion Harbor inlet region to preserve rapidly eroding habitat in a prime horseshoe crab spawning area. Due to funding limitations, only small stop-gap measures were implemented to limit the degradation. It was not until post-Sandy National Wildlife Foundation and USFWS funds of $5.8 million, along with $2 million in state funds, allowed for the three-year restoration project to be completed in 2018. The work included the raising of the existing rock structure that served as a breakwater and jetty. Originally constructed in the 1980s to protect the harbor, it was raised, widened, and extended to tie into the existing dune. The sandy beach areas protected by the structure were nourished and planted with beach grass.

Secondly, south of Mispillion Harbor is the Prime Hook National Wildlife Refuge. The DCP had been working with the Refuge staff since 2010 to examine its concerns of water quality and loss of habitat. After several storms caused minor breaches in the freshwater impoundments along the Delaware Bay, Superstorm Sandy destroyed large sections of the dunes essentially converting the impoundments into a tidal bay. Instead of restoring the freshwater impoundments, the DCP worked closely with USFWS engineers to conduct a large-scale tidal marsh restoration project. It was one of the largest marsh restoration projects ever done in the eastern United States. The restored hydrological and salinity regimes now are supporting the natural recolonization of salt marsh grasses and provide flood protection to the neighboring communities.

The coastal zone generally runs the length of the state along the Delaware River, the C&D Canal, the Delaware Bay, the Inland Bays, and the Atlantic Ocean. The state coastal zone is different from the federally designated coastal zone related to federal consistency with state policies under the Coastal Zone Management Act throughout Delaware lands and waters. Delaware Coastal Programs manages the Delaware's Coastal Zone Management Federal Consistency reviews to ensure that state and federal actions in the Coastal Zone are consistent and coordinated. The entire state is classified as a coastal zone under the federal Coastal Zone Management Act due to the proximity of inland areas to tidal waters: no geographic location within the state is more than 8 miles from tidal waters. Erosion is most prominent along the direct coastline.

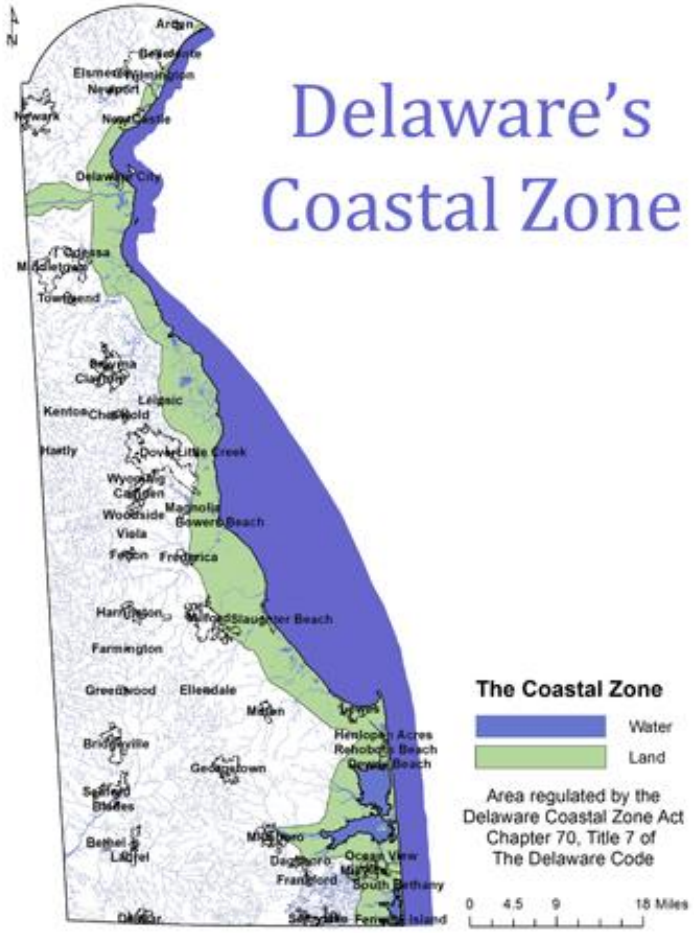


Figure 3: Coastal Zone Map

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

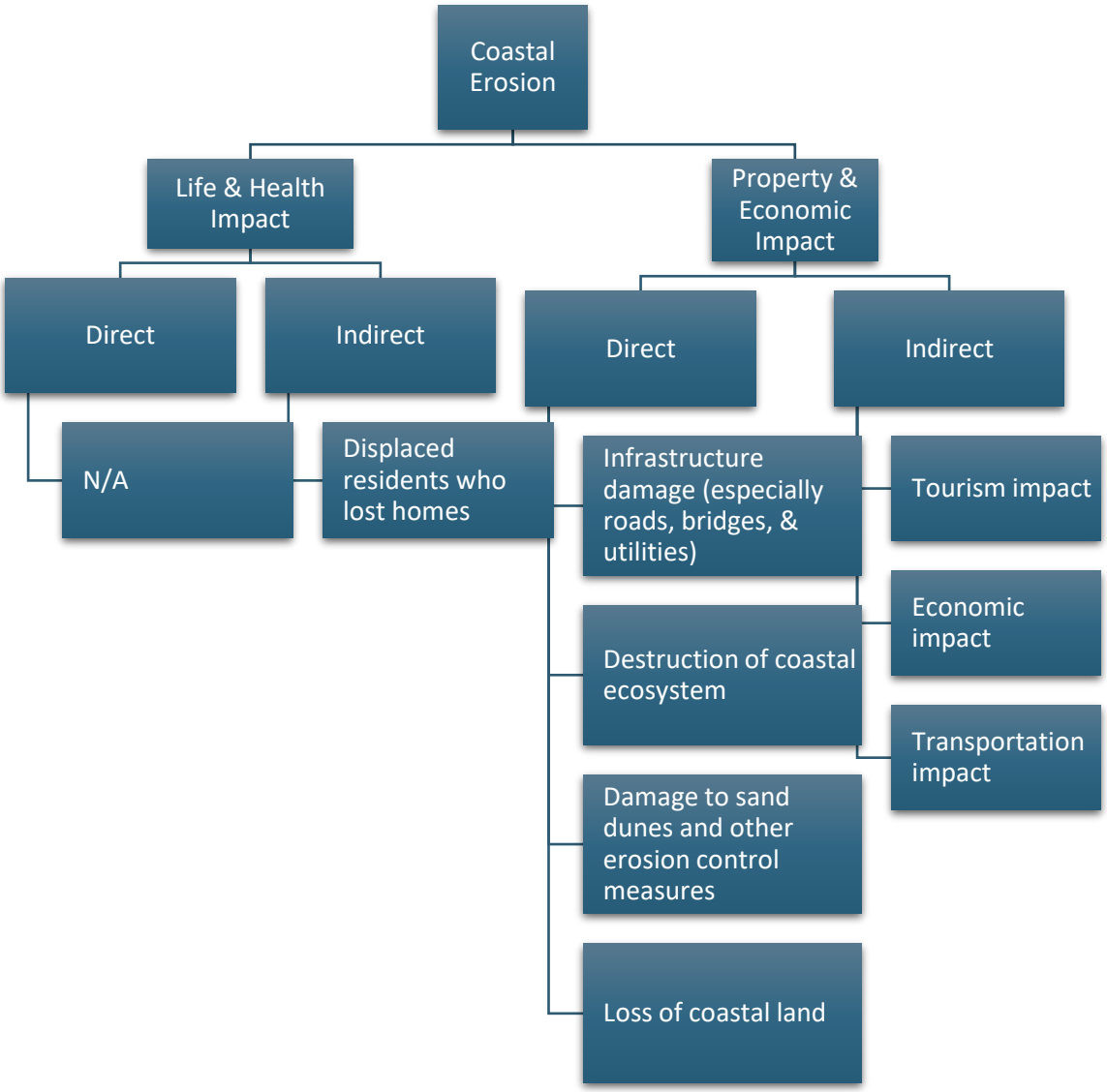


Figure 4: Potential Coastal Erosion Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 9: Coastal Erosion EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Moderate	Impact in the incident area expected to be moderate.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.

Subject	Ranking	Impacts
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Severe	Impact to property, facilities, and infrastructure could be severe. Facilities, Infrastructure, and personnel could be severely affected.
Delivery of Services	Moderate	Moderate impact on services expected.
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.2 Coastal Flooding

Table 10: Coastal Flooding Overview

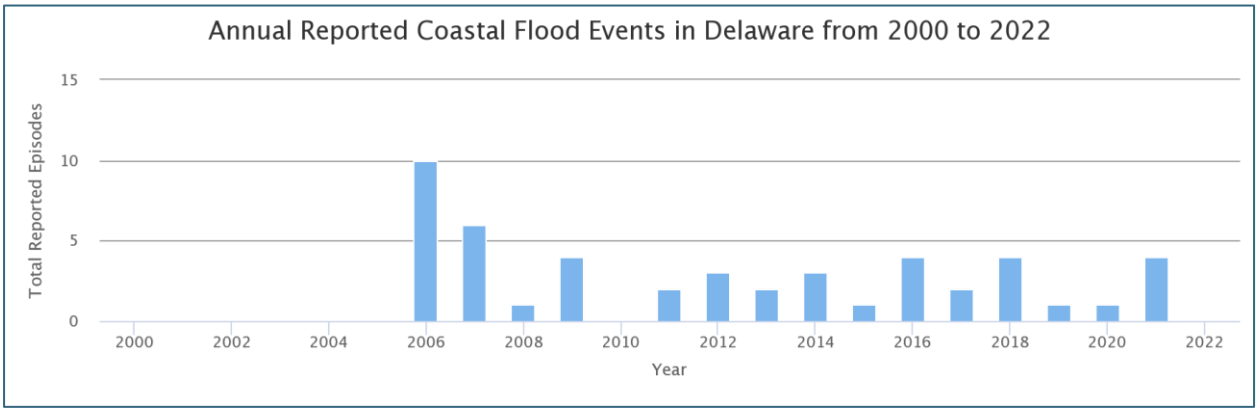
Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Coastal Flooding	Highly Likely	Critical	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; impact of climate change; and the State's classification as a coastal zone,

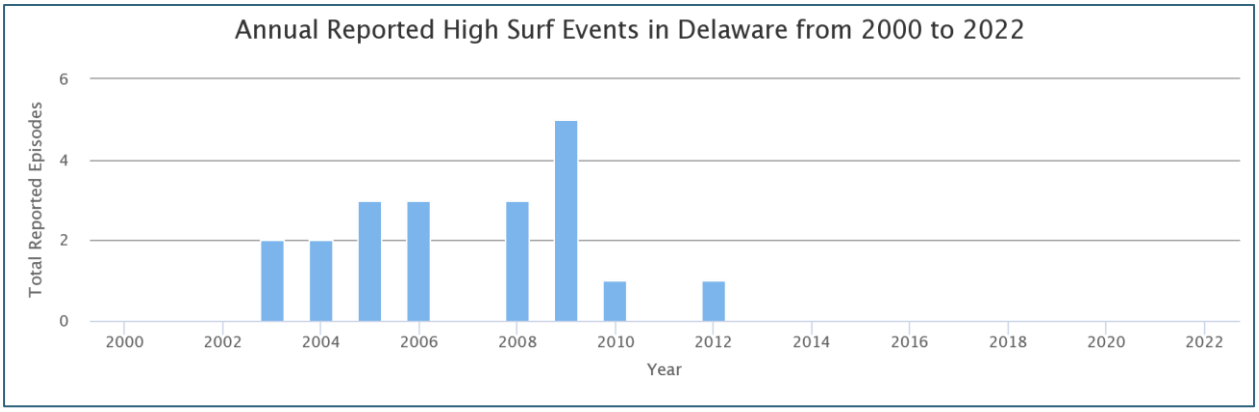
- the probability of future coastal flooding is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of coastal flooding is **Critical** (multiple deaths/injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by coastal flooding is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for coastal flooding is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

Coastal flooding included data for coastal floods, high surf, rip currents, and storm surge/tides. Data was derived from the Climate and Hazard Mitigation Planning (CHaMP) Tool.

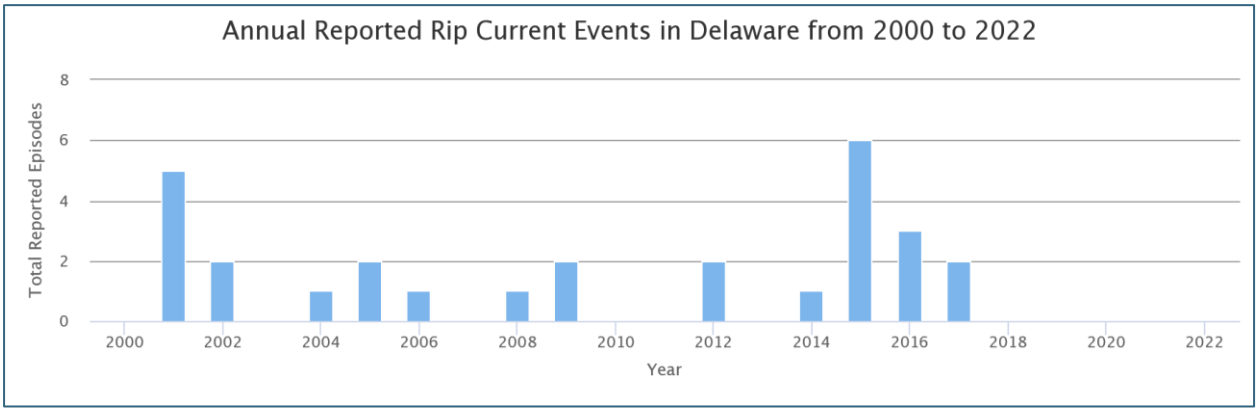
A **coastal flood** event is defined as a rise in sea level to above normal levels due to high tides, onshore winds, and/or low atmospheric pressure (but not a tropical storm) on land that is adjacent to the ocean or its connected bays and estuaries. In Delaware, data on past coastal flood episodes show that Delaware reported experiencing 48 coastal flood events between 2000 and 2022. These events resulted in $49,712,000 in reported property damage. There was no reported crop damage, no reported deaths, and no reported injuries.



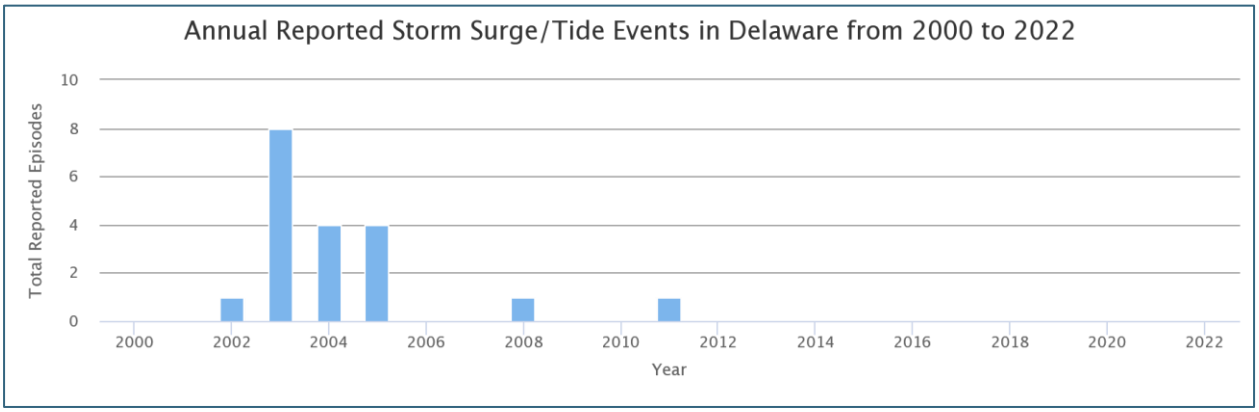
A **high surf** event is defined as the occurrence of large waves, caused by a distant storm or by strong onshore winds, that break either on or near the shore and cause fatality, injury, or other damage. In Delaware, data on past high surf episodes show that Delaware reported experiencing 20 high surf events between 2000 and 2022. These events resulted in $100,000 in reported property damage and 66 reported injuries. There was no reported crop damage and no reported deaths.



A **rip current** is defined as “a narrow channel of water that flows away from the beach, through the surf and dissipates beyond the breaking waves”. A rip current can form in any body of water that has breaking waves. Rip current events are reported/recorded only when they necessitate one or more rescues, cause a drowning or near-drowning, or cause any damage to watercraft. In Delaware, data on past rip current episodes show that Delaware reported experiencing 28 rip current events between 2000 and 2022. These events resulted in 3 reported deaths and 42 reported injuries. There was no reported property damage and no reported crop damage.



A **storm surge/tide** event is defined as when coastal and lakeshore areas experience a rise in water above normal levels that is “associated with a storm of tropical origin (e.g. hurricane, typhoon, tropical storm, or subtropical storm)” that results in injuries, fatalities, or other damage In Delaware, data on past storm surge/tide episodes show that Delaware reported experiencing 19 storm surge/tide events between 2000 and 2022. These events resulted in $1,000,000 in reported property damage. There was no reported crop damage, no reported deaths, and no reported injuries.



Altogether, the elements identified within this profile have caused $50.812M of property damage, 3 deaths, and 108 injuries.

2009 Coastal Flooding Event

From the total property damage from coastal flooding, $45M came from one event on November 12, 2009. According to NOAA, a powerful nor'easter (a remnant of Hurricane Ida) produced wind gusts nearly as high as 60 mph, widespread moderate tidal flooding, heavy rain and severe beach erosion along the Delaware coast from November 12th through the 14th. Roughly 13,000 people in Delaware and Maryland lost power. The combination of heavy rain and tides caused about 50 roads in Delaware, with some parts remaining closed through the 15th as three feet of sand accumulated. Beach erosion was a major impact of the storm, occurring more heavily in Indian Beach and within the Delaware Seashore State Park. In Oak Orchard, Indian River Bay flooding was ranked as the third worst since the 1962 Ash Wednesday nor'easter. Four dunes disappeared in Bethany Beach and no dunes were left along the south side of South Bethany. Waves were measured at 10 feet along the shore.

Governor Jack Markell declared a state of emergency for Kent County and Sussex County to better enable response to the nor'easter. He authorized the Delaware National Guard to position heavy vehicles and personnel in a number of locations and to deliver over 1,000 sandbags.

The coastal Special Flood Hazard Area (SFHA) has three (3) flood hazard zones: Zones VE (which are unique to coastal areas), AE and AO.

Zone VE, also known as a Coastal High Hazard Area, is where wave action and fast-moving water can cause extensive damage during a base flood event.

Zone AE indicates areas that have at least a 1%-annual-chance of being flooded, but where wave heights are less than 3 feet.

Zone AO is used to map areas at risk of shallow flooding during a base (1%-annual-chance) flood, where water with average depths of 1 to 3 feet flows over sloping ground. On flood maps in coastal communities, Zone AO usually marks areas at risk of flooding from wave overtopping, where waves are expected to wash over the crest of a dune or bluff and flow down into the area beyond.

Flood maps in coastal areas may include a line called the Limit of Moderate Wave Action (LiMWA). The LiMWA marks the inland limit of the Coastal A Zone— the part of the coastal SFHA referenced by building codes and standards where wave heights can be between 1.5 and 3 feet during a base flood event. Past events have shown that waves as small as 1.5 feet can cause foundation failure and structural damage to buildings.

The following figure reflects the coastal SFHA zones and LiMWA line.

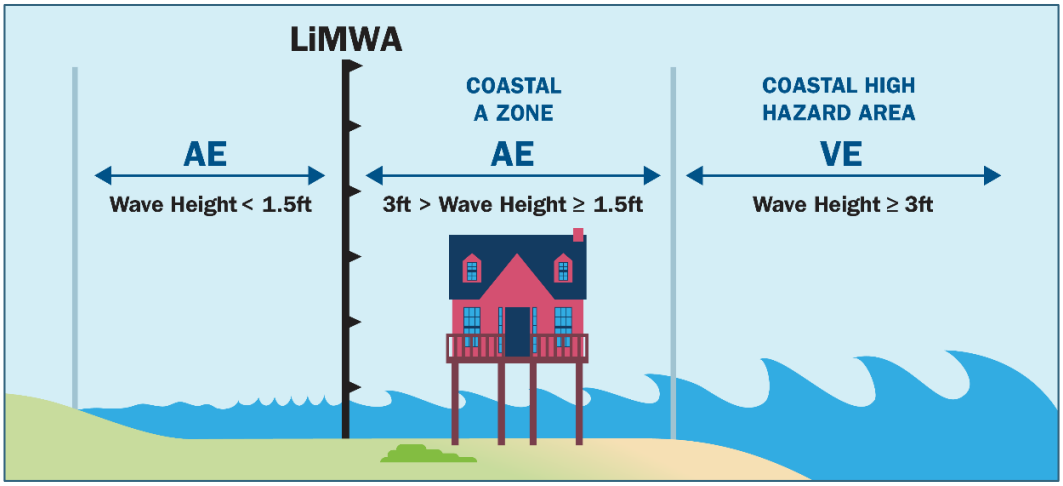


Figure 5: Coastal SFHA Zones

Base Flood Elevations (BFEs) in these flood zones vary along the coast and with distance inland. Changes in flood zones and BFEs can have a significant impact on building requirements and flood insurance costs. BFEs may differ dramatically within a small area, because waves can diminish in size over a short distance upon encountering obstructions or steep ground. Areas with a low to moderate hazard are shown as **Zone X**. However, a low risk of flooding does not mean there is no risk of flooding. Over 20% of National Flood Insurance Program (NFIP) claims are filed for properties in low or moderate risk areas.

As mentioned in the coastal erosion section, the coastal zone in Delaware generally runs the length of the state along the Delaware River, the C&D Canal, the Delaware Bay, the Inland Bays, and the Atlantic Ocean. The state coastal zone is different from the federally designated coastal zone related to federal consistency with state policies under the Coastal Zone Management Act throughout Delaware lands and waters. Delaware Coastal Programs manages the Delaware's Coastal Zone Management Federal Consistency reviews to ensure that state and federal actions in the Coastal Zone are consistent and coordinated. The entire state is classified as a coastal zone under the federal Coastal Zone Management Act due to the proximity of inland areas to tidal waters: no geographic location within the state is more than 8 miles from tidal waters. Erosion is most prominent along the direct coastline.

The coast of Delaware encompasses 381 miles of shoreline, including the 24 miles that front the Atlantic Ocean, with barrier beaches, inland bays, small islands, and highly productive estuaries, marshes, and tidal flats. Potential effects from sea level rise include inundation of wetlands and other low-lying lands, erosion of beaches, intensified flooding, and increased salinity of rivers, bays, and groundwater tables. Storm surge becomes a threat to high-valued property located along the coast of Delaware as sea level rises as well.

Coastal areas are defined as those portions of coastal land zones (coastal county/parish) adjacent to the waters, bays, and estuaries of the oceans. Terrain (elevation) features will determine how far inland the coastal flooding extends. These locations are represented in the following coastal inundation maps that are also in the Coastal Erosion section above.

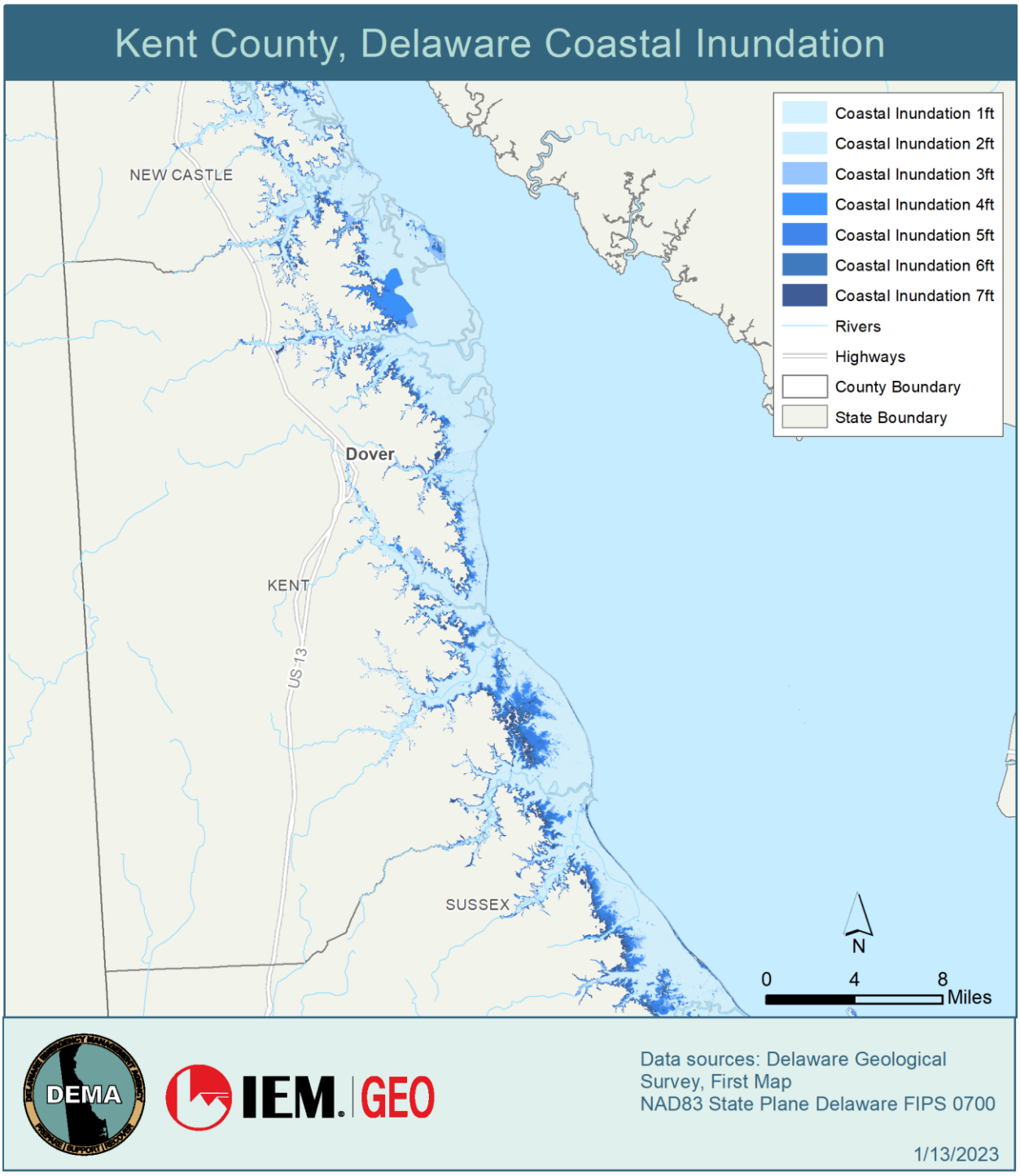


Figure 6: Kent County Coastal Inundation

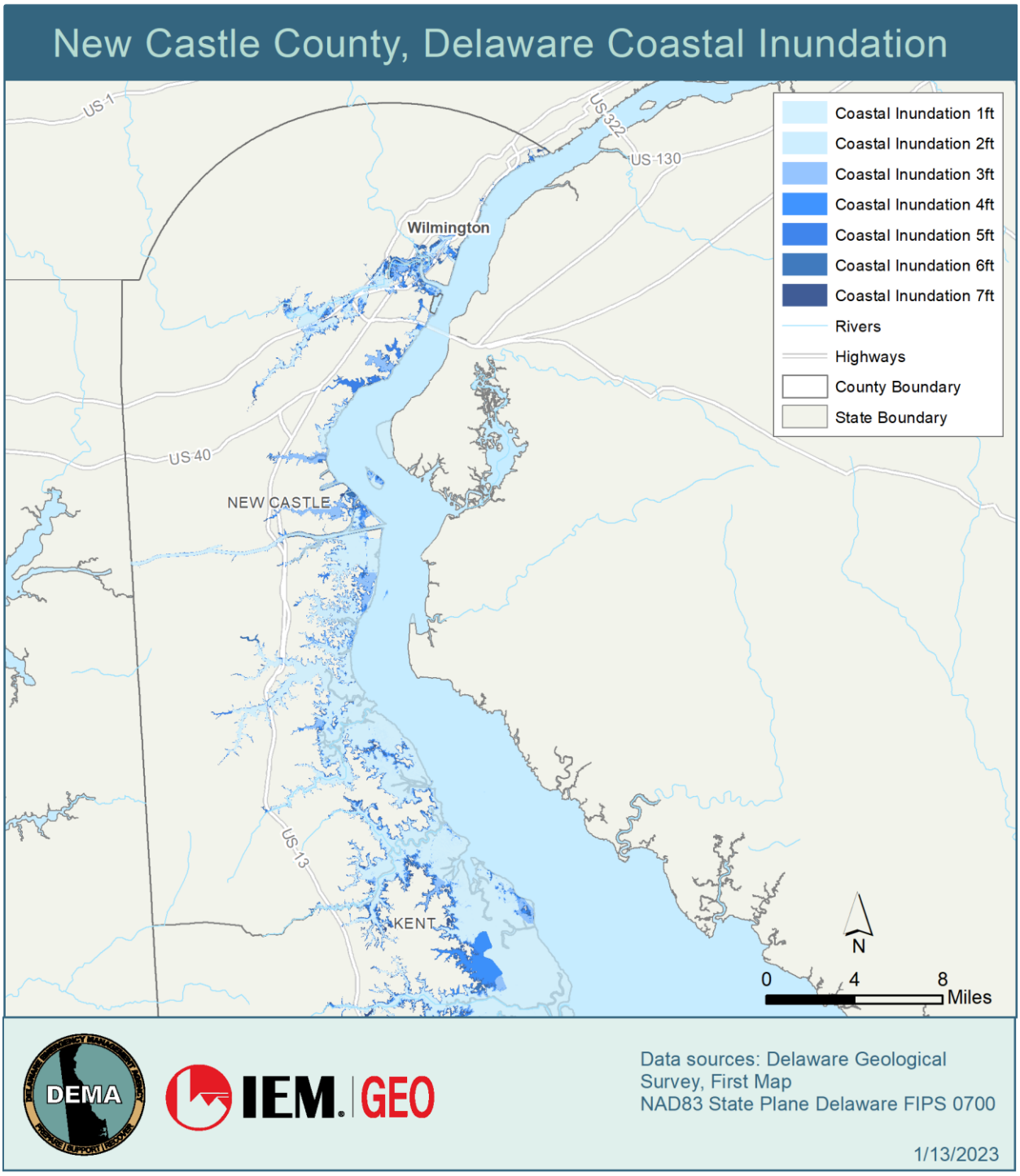


Figure 7: New Castle County Coastal Inundation

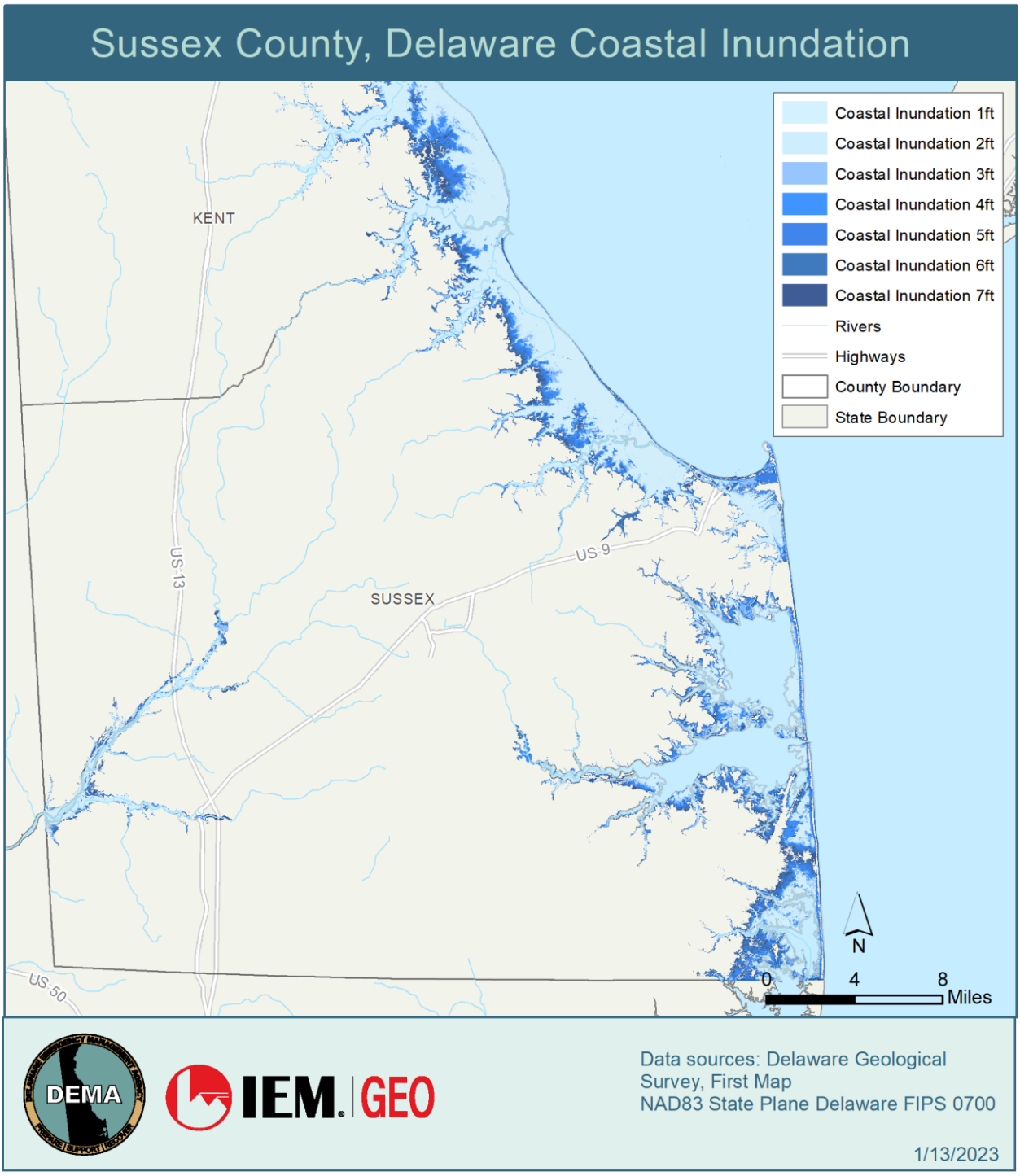


Figure 8: Sussex County Coastal Inundation

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

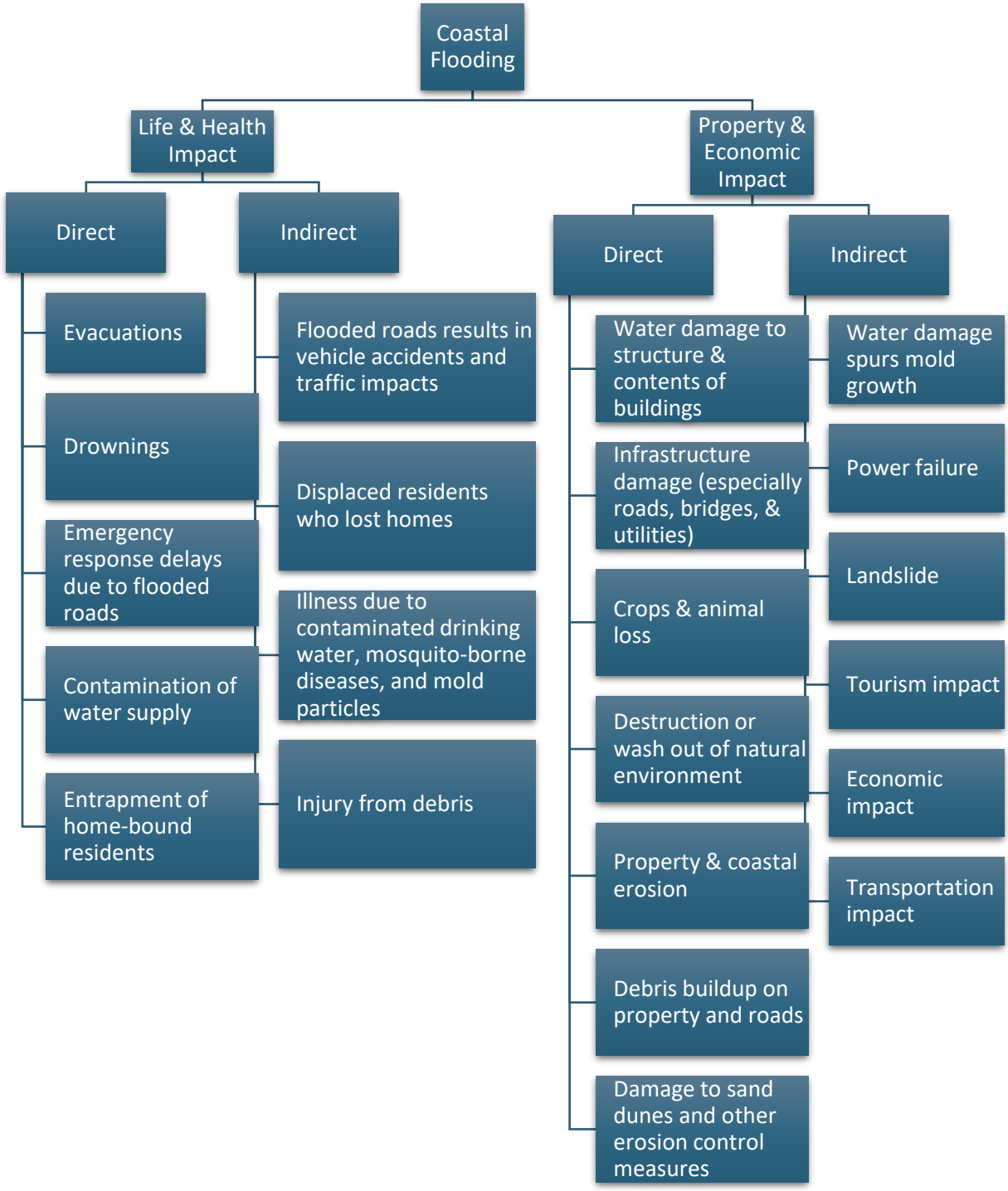


Figure 9: Potential Coastal Flooding Impacts

FEMA's Hazus software version 6.0 was used to estimate potential flood losses across the state. Hazus regions were generated for each county as a combined riverine and coastal flood hazard type. 1 arc-second Digital Elevation Models (DEMs) were used to generate stream networks using a drainage area of 10 square miles. Coastal flood was modeled based on 100-year flood conditions using a 3-foot stillwater elevation.

The full report is in **Appendix B**, but below are summary tables of the results.

Table 11: Direct Economic Losses for Buildings for 100-Year Coastal Flood

Capital Stock Losses	Cost Building Damage	Contents Cost	Damage	Inventory Loss	Loss Ratio %
Kent	1,822,000	1,841,000	142,000	0.1	
New Castle	14,207,000	19,203,000	1,216,000	0.3	
Sussex	31,543,000	26,147,000	1,609,000	0.3	
Total	**47,572,000**	**47,191,000**	**2,967,000**	**0.23**	

Table 12: Indirect Economic Losses for Building for 100-Year Coastal Flood

Income Losses	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss
Kent	877,000	1,228,000	1,831,000	307,000
New Castle	4,227,000	9,207,000	9,223,000	3,097,000
Sussex	25,064,000	20,185,000	23,899,000	11,881,00
Total	**30,168,000**	**30,620,000**	**34,953,000**	**208,756,000**

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 13: Coastal Flooding EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Moderate	Impact in the incident area expected to be moderate.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Severe	Impact to property, facilities, and infrastructure could be severe. Facilities, Infrastructure, and personnel could be severely affected.
Delivery of Services	Moderate	Moderate impact on services expected.

Subject	Ranking	Impacts
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.3 Dam/Levee Failure Flooding

Table 14: Dam/Levee Failure Flooding Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Dam/Levee Failure Flooding	Occasional	Limited	Catastrophic	Minimal	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change,

- the probability of a future dam failure flood flooding event is **Occasional**, with a probable recurrence interval of 11 to 100 years;
- the potential life impact of a dam failure flood flooding event is **Limited** (minor injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by a dam failure flooding occurrence is **Minimal** (10 to 25 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for dam failure flooding is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

Table 15: Delaware Dam Facts by USACE

83 Total Dams	**85 years** Average Age	**60%** High Hazard Potential Dams with an EAP	**0%** Federally Regulated Dams
		0% Dams with Hydropower	**54%** State-Regulated Dams

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water and is considered critical infrastructure. Dams typically are constructed of earth, rock, concrete, or mine tailings. A **dam failure** is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. According to the Association of State Dam Safety Officials, dam failures are most likely to happen for one of five reasons:

- **Overtopping** caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam failures.
- **Foundation Defects**, including settlement and slope instability, cause about 30% of all dam failures.
- **Cracking** caused by movements like the natural settling of a dam.
- **Inadequate maintenance and upkeep.**
- **Piping** is when seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes in the dam. Another 20% of U.S. dam failures have been caused by piping (internal erosion caused by seepage). Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.

Since 2015, the Dam Safety Program has continued the water level monitoring project to install and maintain continuous water level monitors at state owned dams. The instrumentation provides near real-time monitoring and alerts of pond/lake water levels.

Being able to remotely monitor the water levels in these ponds has greatly improved the efficiency and response time in managing these dams to prevent overtopping and failure. This information is also accessible to the public with an internet connection.

In this section, we are addressing the flooding caused by dam failure, as the flooding is the natural hazard component.

The hazard intensity rating scale for dam failure flooding is based on the amount of potential damage that can be caused by a failure. For the purposes of this hazard analysis, damage from dam failure only takes into account areas where developed property is affected.

Table 16: Dam/Leve Failure Flooding Intensity Scale

Classification		
Weak	**Moderate**	**Major**
• <20% of critical facilities in the inundation zone • Dam Storage capacity less than 10,000 acre-feet	• 20-50% of critical facilities in the inundation zone • Dam Storage capacity between 10,000 and 100,000 acre- feet	• >50% of critical facilities in the inundation zone • Dam Storage capacity 100,000 acre-feet or more

The National Inventory of Dams (NID) is a database, maintained and published by the US Army Corps of Engineers, that contains information about a dam's location, size, purpose, type, last inspection and regulatory facts for dams that meet their criteria. The NID lists 83 regulated and unregulated dams in Delaware. Out of the 83 dams in Delaware, 57 are considered high hazard and are required to have an Emergency Action Plan (EAP). The primary type of all the dams are gravity, except for Edgar M. Hoopes Dam which is concrete. Of the 57 high hazard dams, 37 are state regulated by DNREC. The following High Hazard Dam Map locates the 57 high hazard dams within the state followed by tables with dam details.

Recent Dam Project

According to Delaware's records, Hearns Pond Dam was overtopped during storms of August 11, 2001 and June 25, 2006. The dam was damaged by both storms. Because of these failures, DNREC funded a study to evaluate the condition and potential hazards of the dam and develop alternatives to bring the dam into conformance with Delaware Dam Safety Regulations. The study indicated that the spillway and bridge at Hearns Pond Dam did not have capacity to convey discharge from the required Design Storm event. Therefore, rehabilitation of the dam was necessary to bring it into conformance with Dam Safety Regulations. The rehabilitation consisted of replacing the spillway and the twin box culverts at the dam with a larger spillway and culvert to pass the flow of water, plus the embankments are armored with precast articulated concrete blocks. A new boat ramp was also reconstructed. The $4.2 million project was completed in 2016 and repaired the failing, century-old structure.

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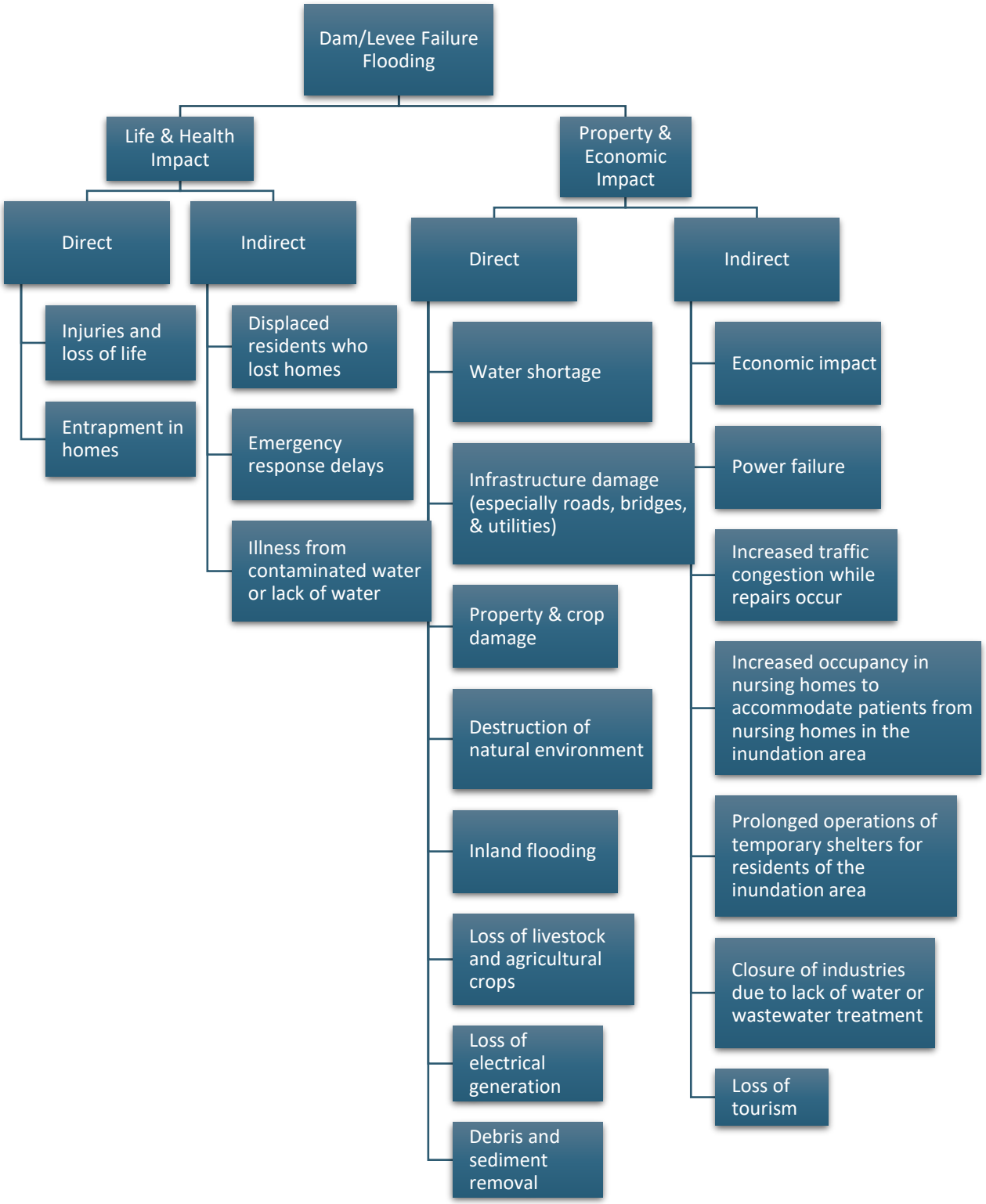

Figure 12: Potential Dam/Levee Failure Flooding Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 21: Dam Failure Flooding EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal	Impact in the incident area expected to be minimal.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Minimal	Impact to property, facilities, and infrastructure could be minimal. Facilities, Infrastructure, and personnel could be minimally affected.
Delivery of Services	Minimal	Minimal impact on services expected.
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.4 Drought

Table 22: Drought Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Drought	Highly Likely	Limited	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change,

- the probability of a future drought is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of drought is **Limited** (minor injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more). Potential impacts are described in the following figures;
- the potential geographic location affected by a drought occurrence is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for drought is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

According to NWS, **drought** is a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area. Conceptually, drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield.

The Palmer Drought Severity Index (PDSI) has been used the longest for monitoring drought. The PDSI allows for a categorization of various levels of wetness and dryness that are prominent over an area. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil.

Palmer values may lag emerging droughts by several months; are less well suited for mountainous land or areas of frequent climatic extremes; and are complex—has an unspecified, built-in time scale that can be misleading.

Instead of referring to the NWS NCEI Storm Database, the planning team referred to the U.S. Drought Monitor for historical occurrences. According to the U.S. Drought Monitor (USDM), since 2000, the longest duration of drought (D1–D4) in Delaware lasted 55 weeks beginning on October 30, 2001 and ending on November 12, 2002. The most intense period of drought occurred the week of August 20, 2002, where D4 affected 74.08% of Delaware land.

PDSI Classification	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

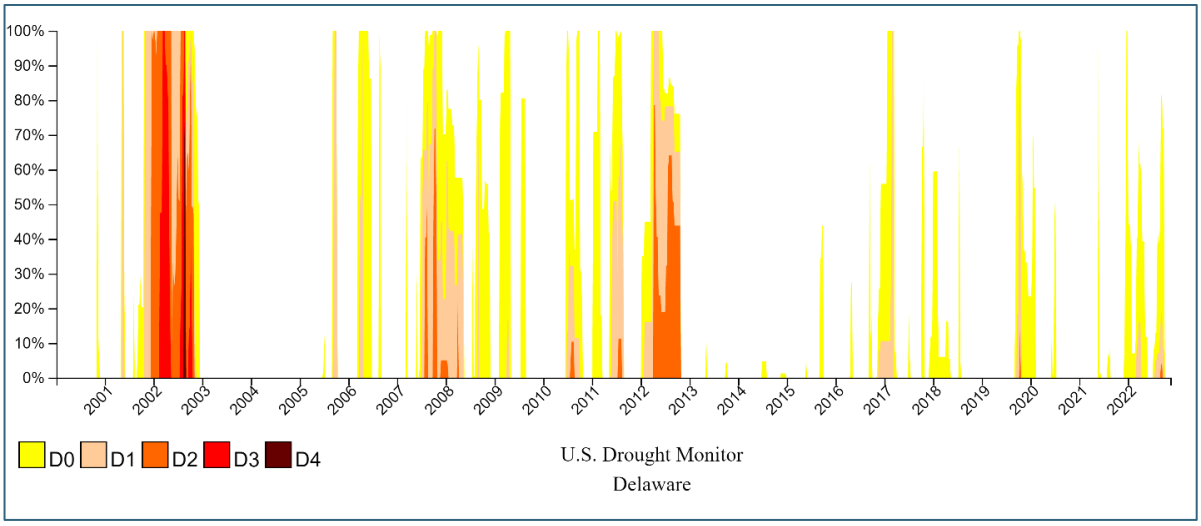

Figure 13: 2000-2022 Historic Drought Monitor

The USDM uses a five-category system, labeled Abnormally Dry or D0, (a precursor to drought, not actually drought), and Moderate (D1), Severe (D2), Extreme (D3) and Exceptional (D4) Drought. Drought categories show experts' assessments of conditions related to dryness and drought including observations of how much water is available in streams, lakes, and soils compared to usual for the same time of year. To monitor and respond to drought, its impacts on a community must be fully understood. Immediate drought impacts can include visibly dry vegetation and lower water levels in lakes and reservoirs. Longer-term impacts, such as land subsidence, seawater intrusion, and damage to ecosystems, can be harder to see, but more costly to manage in the future.

Table 23: Drought Intensity Scale

Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

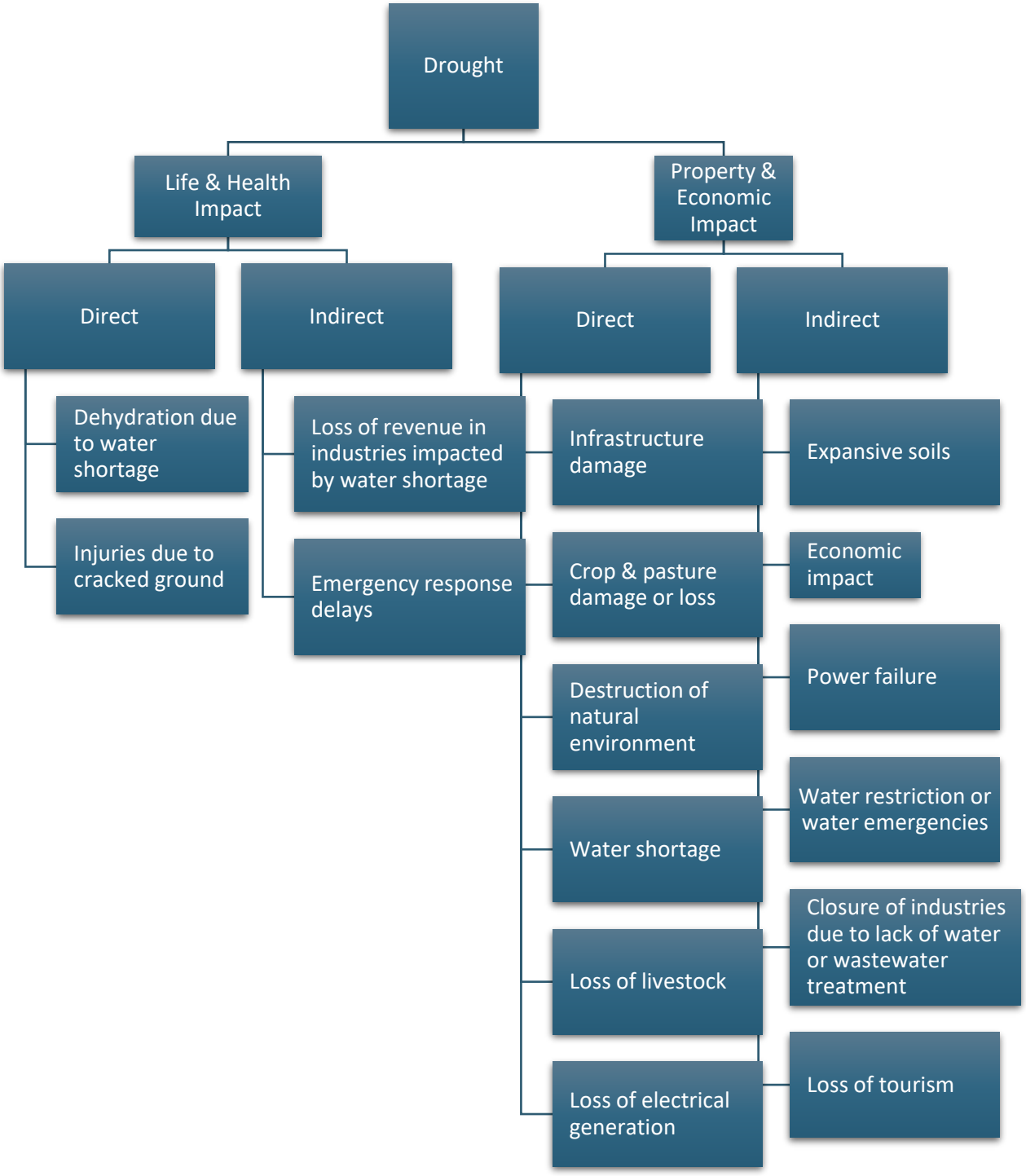

Figure 14: Potential Drought Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 24: Drought EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal	Impact in the incident area expected to be minimal.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated
Property, Facilities, and Infrastructure	Moderate	Crop./pasture loss and widespread water shortage or restrictions.
Delivery of Services	Minimal	Minimal impact on services expected.
Environment	Moderate	Crop/pasture loss and widespread water shortage or restrictions.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.5 Earthquakes

Table 25: Earthquake Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Earthquakes	Occasional	Minor	Limited	Minimal	Weak

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change,

- the probability of a future earthquake is **Occasional**, with a probable recurrence interval of 11 to 100 years;
- the potential life impact of an earthquake is **Minor** (very few injuries, if at all) and potential property impact is **Limited** (more than 10% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one day);
- the potential geographic location affected by an earthquake occurrence is **Minimal** (10 to 25 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for earthquakes is considered **Weak** (a minor classification on the scientific scale, slow speed of onset or short duration of event, resulting in little to no damage).

An **earthquake** is a sudden motion or trembling of the earth, either caused by an abrupt release of accumulated strain on the tectonic plates that comprise the earth's crust or from human activities. Scientific studies have tied some earthquakes to the disposal of wastewater from oil and gas production.

Delaware was reclassified from being a low seismic risk state to being a medium seismic risk state by the USGS and FEMA in 1997, with the Delaware Geological Survey (DGS) operating seismic stations throughout the state.

According to DGS, Delaware has experienced three (3) earthquakes within the state since 2000.

Table 26: Historical Earthquake Events in Delaware

Date	Time	TimeUTC	Lat	Lon	Place	Intensity	Magnitude
8/13/2003	5:46:30 PM	9:46:30 PM	39.7	-75.69	Near Newark	II	1.7
4/9/2005	8:27:06 PM	12:27:06 AM	39.72	-75.51	N Wilmington	I-II	1.2
11/30/2017	4:46 PM		39.198	-75.433	Dover	IV	4.1

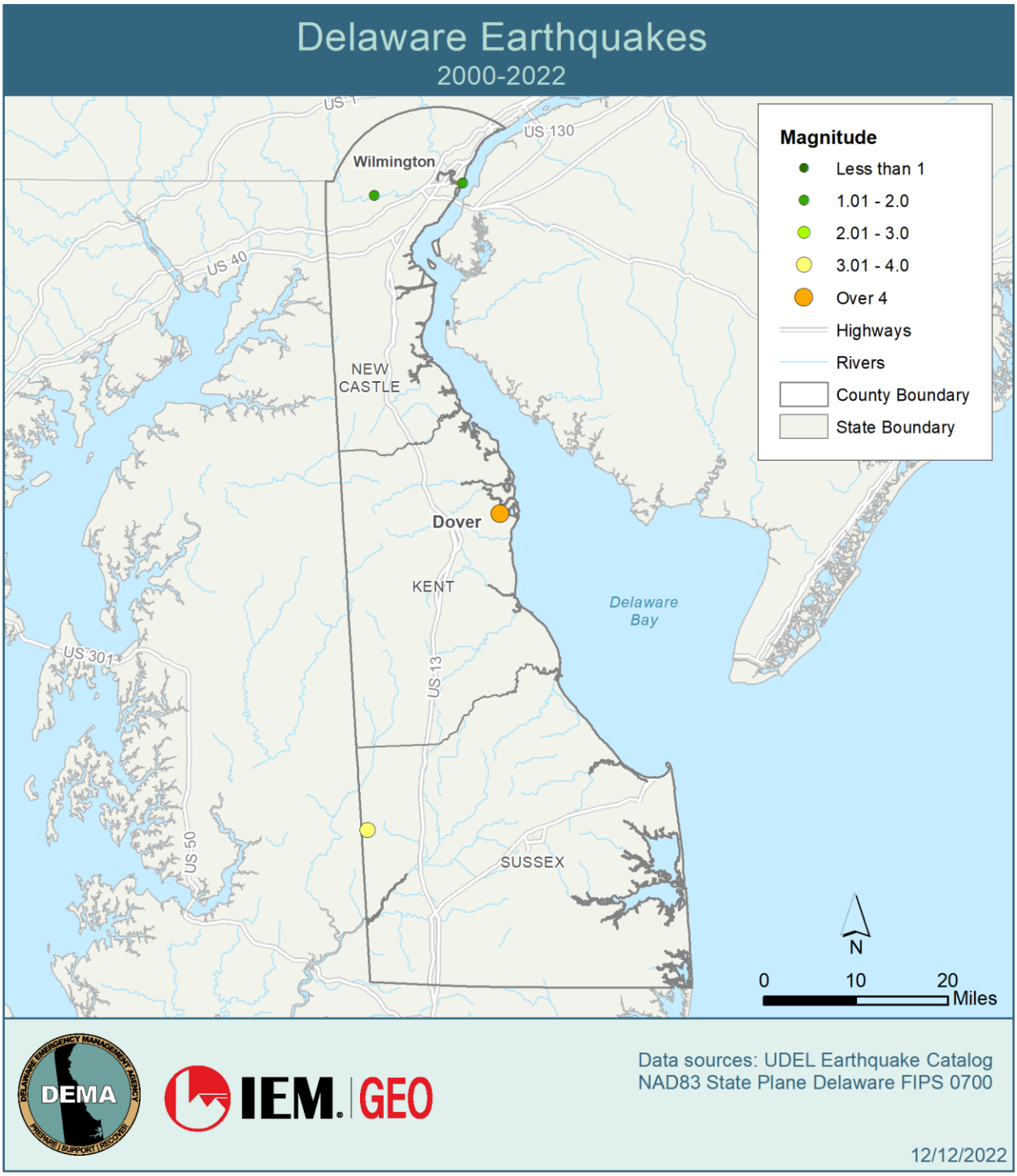

Figure 15: Map of 2000-2022 Earthquakes

According to DGS, fifty-eight (58) earthquakes have been documented in Delaware since 1871, but it is only about every decade or so that there is an earthquake that people would feel (a magnitude of 3.8 or more). To put that into perspective, approximately 3 million earthquakes occur worldwide each year, but ninety-eight percent of them are less than a magnitude 3.

The 2017 Dover earthquake matched the previous largest event in Delaware, which occurred in 1871 and was estimated to have had a magnitude 4.1 based on the historical accounts of shaking. The largest previously recorded event in Delaware occurred in 1973 and had an estimated magnitude of 3.8. The Dover earthquake of 2017 was felt in locations throughout the state of Delaware and along the eastern seaboard from central Virginia to Massachusetts. Reports compiled on the internet by the USGS and DGS indicate a Modified Mercalli Intensity of IV felt closest to the epicenter and III around most of the region

The Modified Mercalli Maximum Probable Intensity Scale classifies earthquakes by the amount of damage inflicted. It quantifies a quake's effects on the land's surface, people, and structures involved. The following is an abbreviated description of the levels of Modified Mercalli intensity.

Table 27: Modified Mercalli Maximum Probable Intensity Scale

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.

Source: USGS Earthquake Hazards Program

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

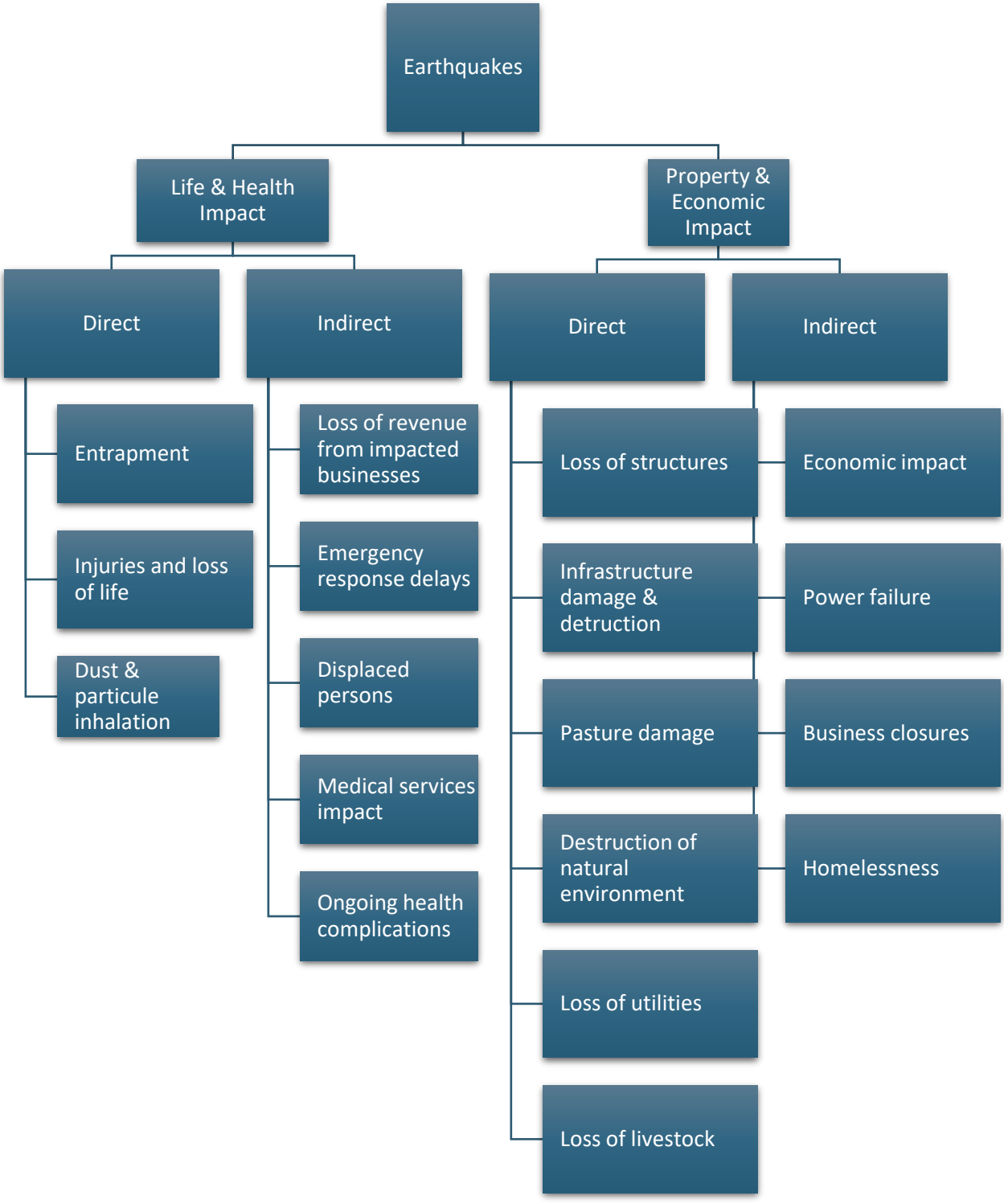

Figure 16: Potential Earthquake Impacts

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4.2.6 Extreme Temperatures

Table 35: Extreme Temperatures Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Extreme Temperatures	Highly Likely	Critical	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change,

- the probability of an extreme temperature event is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of extreme temperature is **Critical** (multiple deaths/injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by an extreme temperature occurrence is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for extreme temperatures is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

Excessive heat is defined as a combination of high temperatures and high humidity (which together form a heat index) that can impact human health. An excessive heat event is recorded/reported when heat indices "meet or exceed locally/regionally established excessive heat warning thresholds." In Delaware, data on past excessive heat episodes show that Delaware reported experiencing 29 excessive heat events between 2000 and 2022. These events resulted in 1 reported death and 26 reported injuries. There was no reported property damage and no reported crop damage.

A **heat** event is defined as a "period of heat resulting from the combination of high temperatures (above normal) and relative humidity" (also termed a heat index) and is reported/recorded "whenever heat index values meet or exceed locally/regionally established advisory thresholds". In Delaware, data on past heat episodes show that Delaware reported experiencing 36 heat events between 2000 and 2022. These events resulted in 3 reported deaths and 7 reported injuries. There was no reported property damage and no reported crop damage.

An **extreme cold/wind chill** event is recorded when "temperatures or wind chill temperatures reach or exceed locally/regionally defined warning criteria". While this varies regionally, it usually occurs when temperatures reach -35 degrees Fahrenheit or colder. In Delaware, data on past extreme cold/wind chill episodes show that Delaware reported experiencing 3 extreme cold/wind chill events between 2000 and 2022. These events resulted in 4 reported deaths and 4 reported injuries. There was no reported property damage and no reported crop damage.

A **cold/wind chill** event is defined as a "period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory [...] conditions". In Delaware, data on past cold/wind chill episodes show that Delaware reported experiencing 19 cold/wind chill events between 2000 and 2022. These events resulted in 1 reported death. There was no reported property damage, no reported crop damage, and no reported injuries.

Altogether, the elements identified within this profile have led to 9 direct deaths and 25 injuries and is predicted to have similar impacts in the future.

Table 36: Historical Extreme Temperature Impacts per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	1	1	-	-	-	-
Inland Sussex	2	1	-	-	-	-
Kent	3	3	-	-	-	-
New Castle	3	20	-	-	12	-
Sussex	-	-	-	-	-	-
2000-2022 TOTAL	**9**	**25**	**-**	**-**	**12**	**-**

Table 37: Historical Extreme Temperature Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2006	2	5	-	-	-	-
2007	5	4	-	-	-	-
2011	-	4	-	-	-	-
2013	1	-	-	-	-	-
2014	1	-	-	-	-	-
2016	-	12	-	-	12	-
22-yr TOTAL	**9**	**25**	**-**	**-**	**12**	**-**
Annual Forecast	*0.41*	*1.14*	-	-	*0.55*	-

The National Weather Service (NWS) offers a Heat Index chart for areas with high heat but low relative humidity. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Below, NOAA's Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index (how hot it feels) is 121°F. The red area without numbers indicates extreme danger. NWS will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days. Excessive heat can be a factor that drastically impacts drought conditions, as high temperatures lead to an increased rate of evaporation. Depending upon humidity, wind, and physical workload, people who work outdoors or don't have access to air conditioning may feel very uncomfortable or experience heat stress or illness on very hot days. Hot days also stress plants, animals, and human infrastructure such as roads, railroads, and electric lines. Increased demand for electricity to cool homes and buildings can place additional stress on energy infrastructure.

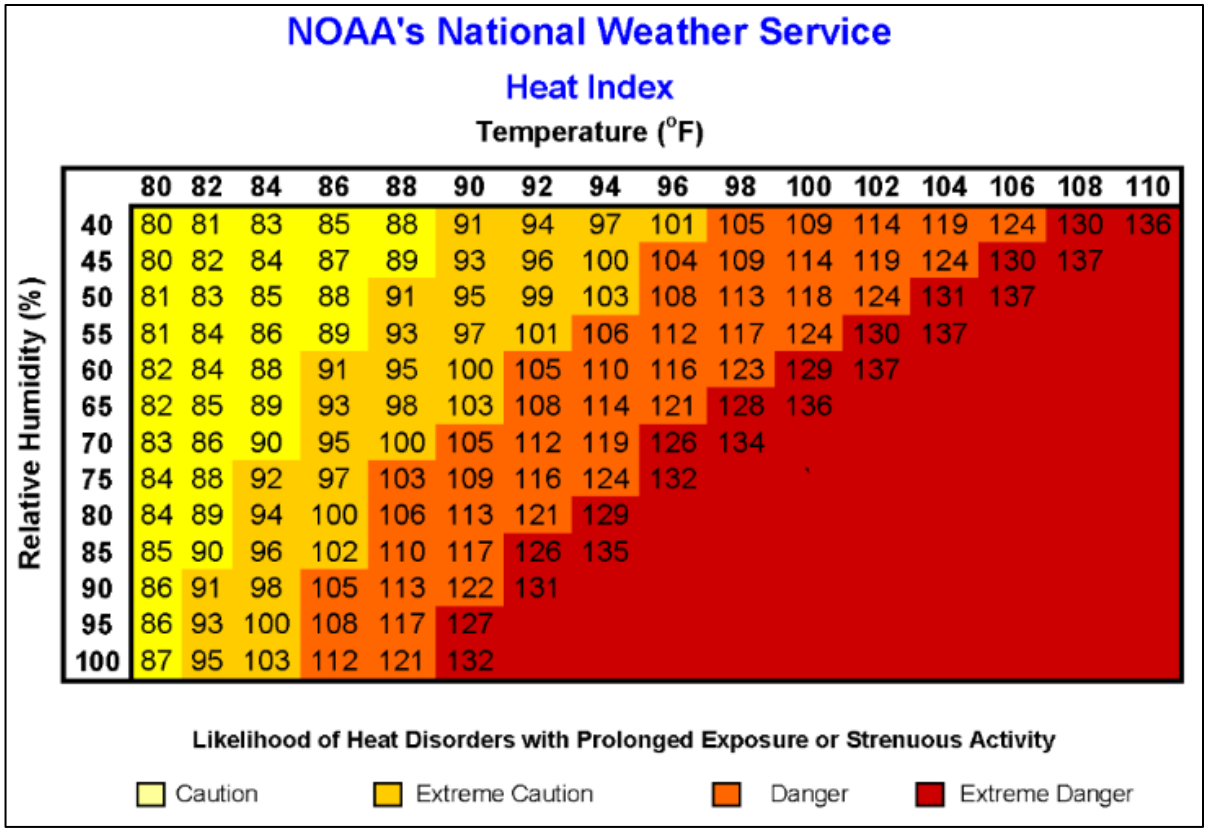


Figure 17: NWS Heat Index

Extreme heat can be exacerbated by the use of concrete in urban development in the form of urban heat island effect. According to the EPA, structures such as buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than natural landscapes such as forests and water bodies. Urban areas, where these structures are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to outlying areas. These pockets of heat are referred to as "heat islands." Heat islands can contribute to a range of environmental, energy, economic, and human health impacts.

When it comes to extreme cold, based on DNREC's Delaware Climate Change Impact Assessment (2014) Report, wintertime temperatures are expected to moderate some under future climate conditions. On average, climate projections show Delaware experiencing 10 fewer days with minimum temperatures below 20°F, which are currently averaging around 15 days per year. However, the variability in the climate change models is at least 10 days, therefore, it's difficult to say with certainty that Delaware will see 10 fewer extreme cold days by the end of the 21st century, though some downward trend is likely.

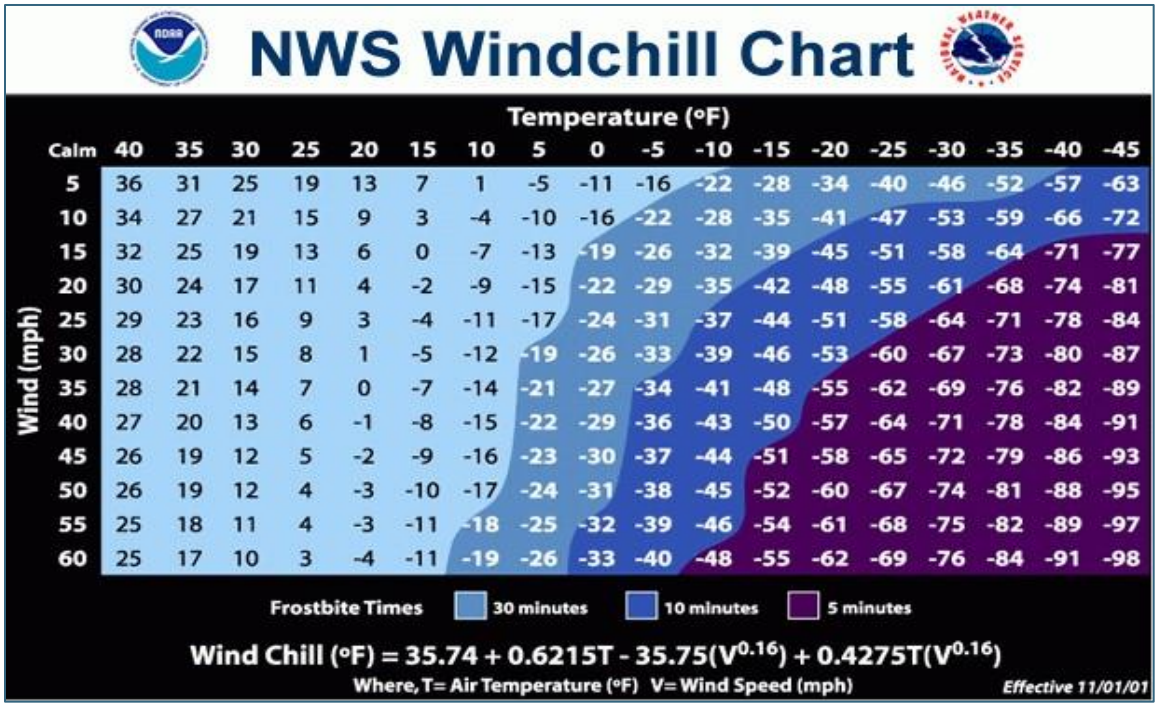


Figure 18: NWS Windchill Chart

The NWS Wind Chill Temperature (WCT) index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. The index does the following:

- Calculates wind speed at an average height of 5 feet, the typical height of an adult human face, based on readings from the national standard height of 33 feet, which is the typical height of an anemometer
- Is based on a human face model
- Incorporates heat transfer theory based on heat loss from the body to its surroundings, during cold and breezy/windy days
- Lowers the calm wind threshold to 3 mph
- Uses a consistent standard for skin tissue resistance
- Assumes no impact from the sun, i.e., clear night sky

According to NOAA NCEI, from 2000-2022 Delaware has experienced 89 days of extreme temperatures (heat and cold) and has an average occurrence of roughly 4.05 days of extreme temperatures per year.

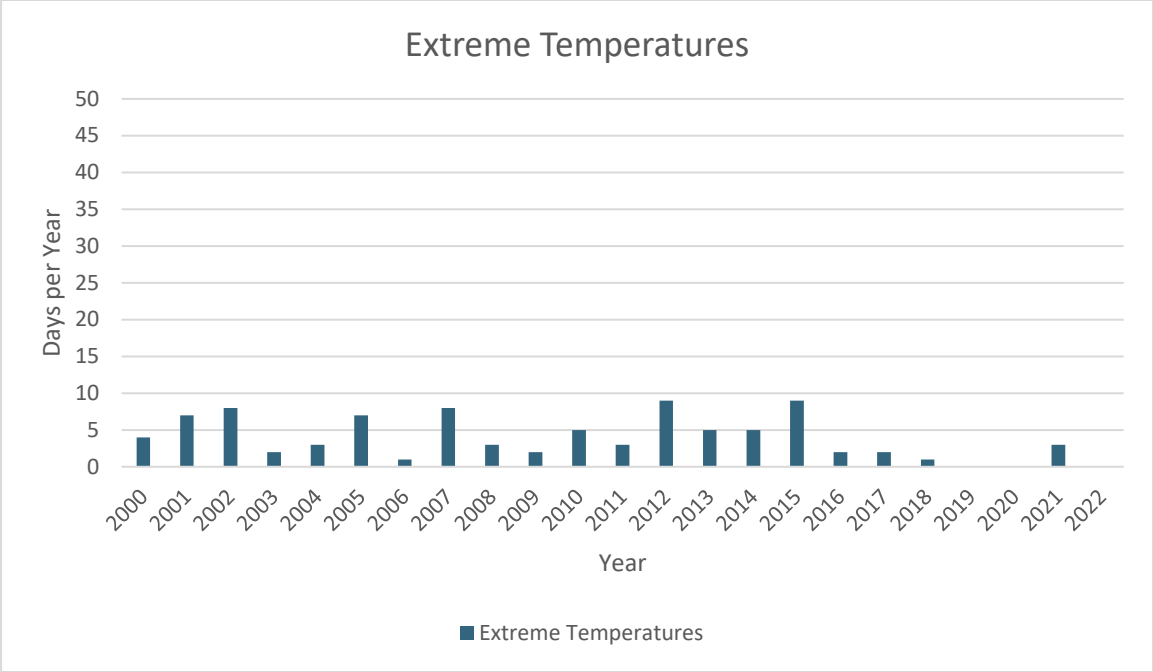


Figure 19: Days of Extreme Temperatures

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure. It is understood that vulnerable populations are at higher risk of extreme temperature impacts.

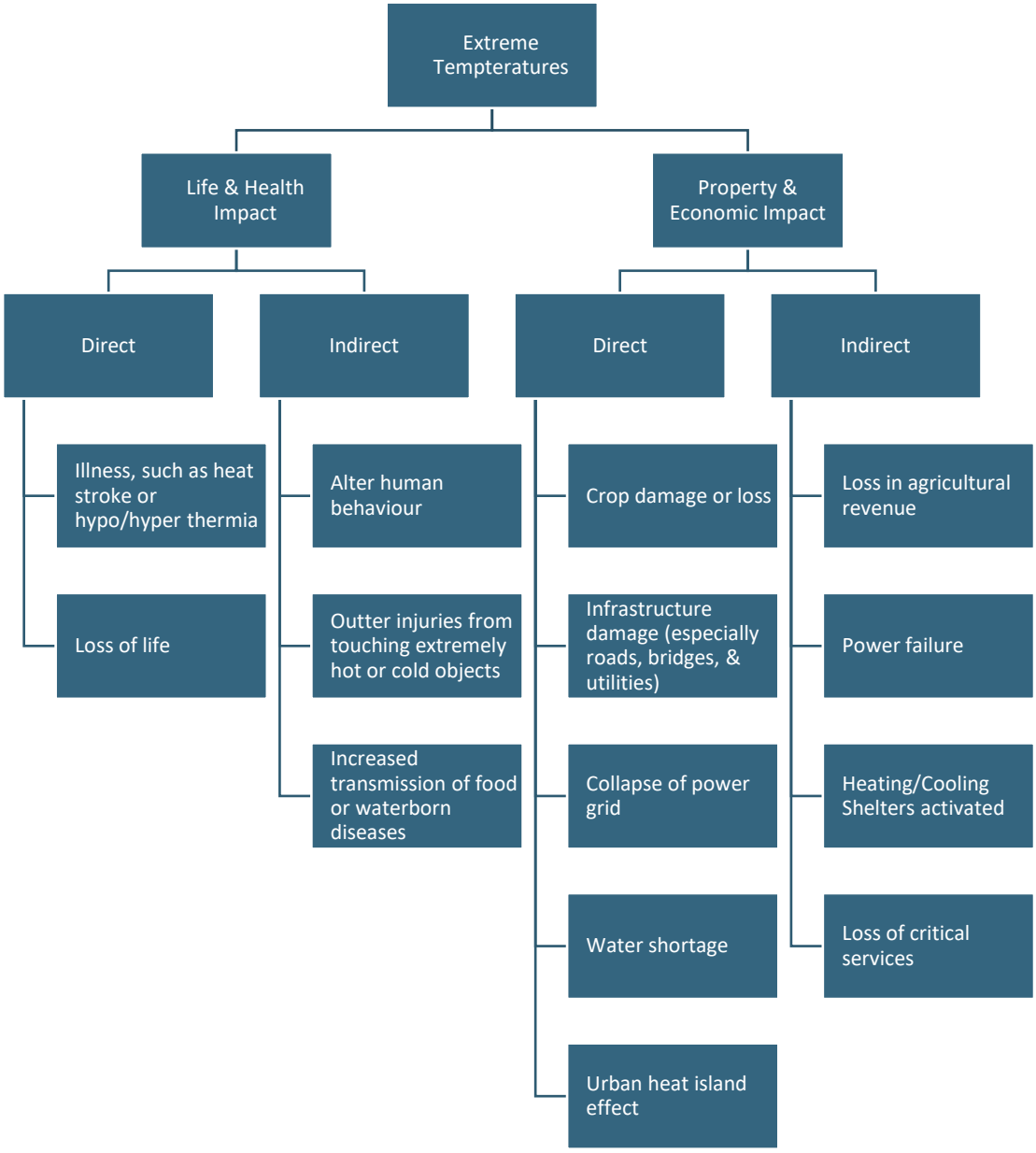


Figure 20: Potential Extreme Temperature Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 38: Extreme Temperatures EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Minimal	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the winter storm, longevity of the storm, and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.7 Inland Flooding

Table 39: Inland Flooding Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Inland Flooding	Highly Likely	Limited	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change,

- the probability of a future inland flooding event is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of inland flooding is **Limited** (minor injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by inland flooding is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for inland flooding is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

Flash flooding is a life-threatening, rapid rise of water into a normally dry area beginning within minutes to multiple hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to the shorter-term flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Flash flooding, such as dangerous small stream or urban flooding and dam or levee failures, requires immediate action to protect life and property. Conversely, flash flooding can transition into flooding as rapidly rising waters abate. Construction and development can change the natural drainage and create brand new flood risks as the concrete that comes with new buildings, parking lots, and roads create less land that can absorb excess precipitation from heavy rains.

Flash floods often have a dangerous wall of roaring water that carries rocks, mud, and other debris that can sweep away most things in its path.

A **flood** is any high flow, overflow, or inundation by water which causes damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, that poses a threat to life or property. Urban and small stream flooding commonly occurs in poorly drained or low-lying areas. These are types of areal flooding and are to be recorded as Flood events, not Heavy Rain. River flooding may be included as a Flood event. However, such entries should be confined to the effects of the river flooding, such as roads and bridges washed out, homes and businesses damaged, and the dollar estimates of such damage. The Water Resources Services Branch at National Weather Service Headquarters maintains the official records of river stages, flood stages, and crests.

Floodwater can disguise many dangerous obstacles, like uncovered manholes or debris that can cause someone to fall over. Standing water, or water that isn't flowing, can also become a breeding ground for insects that can make people very ill. Another risk can be downed power lines which may still be live.

Altogether, the elements identified within this profile have caused $23.73M of property damage, 2 deaths, and 4 injuries and is predicted to have similar impacts in the future.

Table 40: Historical Inland Flooding Impact per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	-	-	-	-	-	-
Inland Sussex	-	-	-	-	-	-
Kent	-	-	$625,000.00	-	-	-
New Castle	2	4	$20,355,000.00	-	-	-
Sussex	-	-	$2,750,000.00	-	-	-
2000-2022 TOTAL	**2**	**4**	**$23,730,000.00**	**-**	**-**	**-**

Table 41: Historical Inland Flooding Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage
2001	-	-	$1,100,000.00	-
2003	-	1	$16,100,000.00	-
2004	-	1	$625,000.00	-
2006	-	-	$1,000,000.00	-
2009	-	1	-	-
2010	-	1	$655,000.00	-
2011	2	-	-	-
2012	-	-	$600,000.00	-
2013	-	-	$50,000.00	-
2021	-	-	$3,600,000.00	-
22-yr TOTAL	**2**	**4**	**$23,730,000.00**	**-**
Annual Forecast	*0.09*	*0.18*	*$1,078,636.36*	-

According to NOAA NCEI, from 2000-2022 Delaware has experienced 214 days of inland flooding events and has an annual forecast of 9.73 days of inland flooding per year.

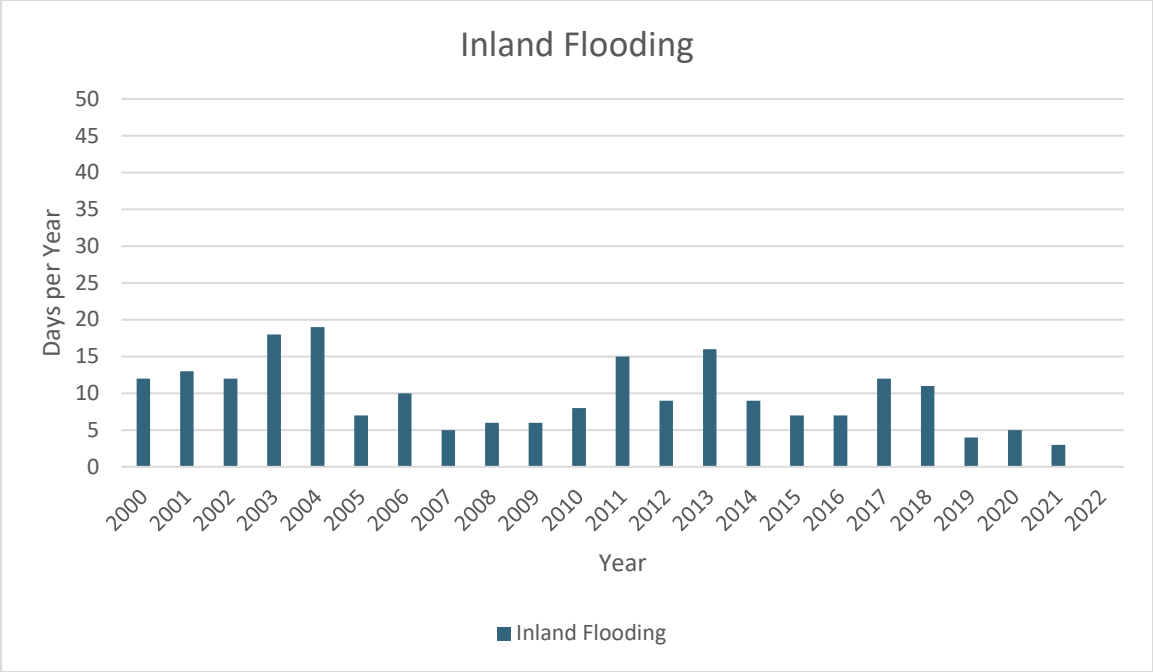


Figure 21: Days of Inland Flooding

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

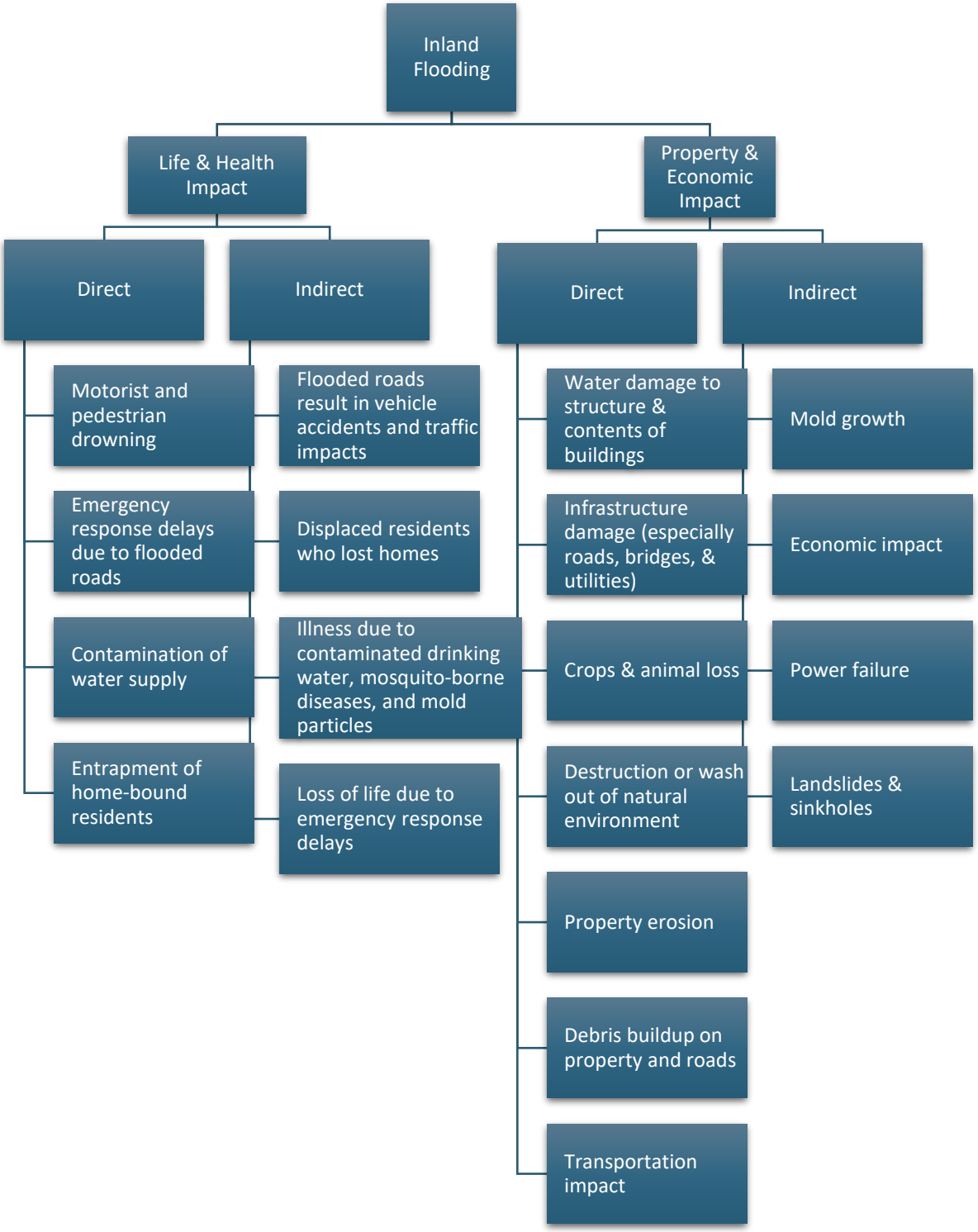


Figure 22: Potential Inland Flooding Impacts

FEMA's Hazus software version 6.0 was used to estimate potential flood losses across the state. Hazus regions were generated for each county as a combined riverine and coastal flood hazard type. 1 arc-second Digital Elevation Models (DEMs) were used to generate stream networks using a drainage area of 10 square miles. The flood hazard data was combined with the Hazus inventory data and user-defined datasets to estimate damages and associated losses for a 1% annual chance flood event, also called a 100-year flood event. Flood depth data was not available for multiple flood frequencies, so average annualized losses could not be calculated.

The full report is in **Appendix B**, but below are summary tables of the results.

Table 42: Direct Economic Losses for Buildings for 100-Year Riverine Flood

Capital Stock Losses	Cost Building Damage	Contents Damage Cost	Inventory Loss	Loss Ratio %
Kent	$24,388,000	$37,250,000	$2,237,000	0.6
New Castle	$321,634,000	$496,616,000	$36,594,000	2.9
Sussex	$51,660,000	$88,475,000	$14,338,000	0.6
Total	**$397,682,000**	**$622,341,000**	**$53,169,000**	

Table 43: Indirect Economic Losses for Buildings for 100-Year Riverine Flood

Income Losses	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss
Kent	$10,108,000	$21,915,000	$42,589,000	$5,297,000
New Castle	$201,130,000	$642,618,000	$366,693,000	$144,796,000
Sussex	$18,496,000	$24,609,000	$28,327,000	$7,733,000
Total	**$229,734,000**	**$689,142,000**	**$437,609,000**	**$157,826,000**

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 44: Inland Flooding EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads

Subject	Ranking	Impacts
		and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the flooding and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.8 Local Earth Movement

Table 45: Local Earth Movement Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Local Earth Movement	Occasional	Minor	Limited	Minimal	Weak

Based on historical, scenario, and exposure analysis; changes in development; and impact of climate change,

- the probability of a future local earth movement event is **Occasional**, with a probable recurrence interval of 11 to 100 years;
- the potential life impact of local earth movement is **Minor** (very few injuries, if at all) and potential property impact is **Limited** (more than 10% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for more than one day.);
- the potential geographic location affected by a local earth movement occurrence is **Minimal** (10 to 25 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for local earth movement is considered **Weak** (a minor classification on the scientific scale, slow speed of onset or short duration of event, resulting in little to no damage).

Local earth movement includes the occurrence of land subsidence, sinkholes, and landslides. Earthquakes are not included in this data, as they are profiled separately in this plan.

Subsidence is the gradual settling or sudden sinking of the Earth's surface due to subsurface movement of earth materials. The level of subsidence ranges from a broad lowering to collapse of land surface. Most causes of subsidence are human-induced, such as groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost. Areas located above or adjacent to karsts topography have a greater risk of experiencing subsidence. Land subsidence can affect areas thousands of square miles in size.

Excessive pumping of aquifer systems may cause permanent subsidence and related ground failures. Land subsidence can damage building foundations which can require significant repairs. It can also cause damage to water supply systems and other underground utility systems or result in buckling of roadways. In some cases, when large amounts of groundwater are removed, the subsoil compaction can reduce the size and number of pore spaces in the soil that may result in a permanent reduction in the storage capacity of the aquifer system.

Sinkholes are a type of subsidence which happen when the ground below the land surface cannot support the land surface. They can occur where rock below the land surface is easily soluble or dissolved by groundwater, such as limestone, carbonate rock, or salt beds. As rock dissolves, spaces and caverns can develop underground. If the underground spaces grow too big to support the land above, a sudden collapse of the land can occur. Areas where the rocks have a high degree of solubility are called "karst terrain". Sinkholes can vary from a few feet across to hundreds of acres, and from less than one to more than 100 feet deep.

Geologic mapping in the Hockessin area shows an area underlain by marble and other carbonate bearing rocks that are particularly susceptible to sinkhole formation. At the request of the New Castle County government, DGS staff regularly review consultant's reports related to proposed construction activities in carbonate areas.

The movement of a mass of rock, debris, or earth down a slope by force of gravity is considered a **landslide**. Landslides occur when the slope or soil stability changes from stable to unstable, which may be caused by earthquakes, storms, volcanic eruptions, erosion, fire, or additional human-induced activities.

Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high.

According to available data sources, there has been no local earth movement in Delaware since 2000. Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

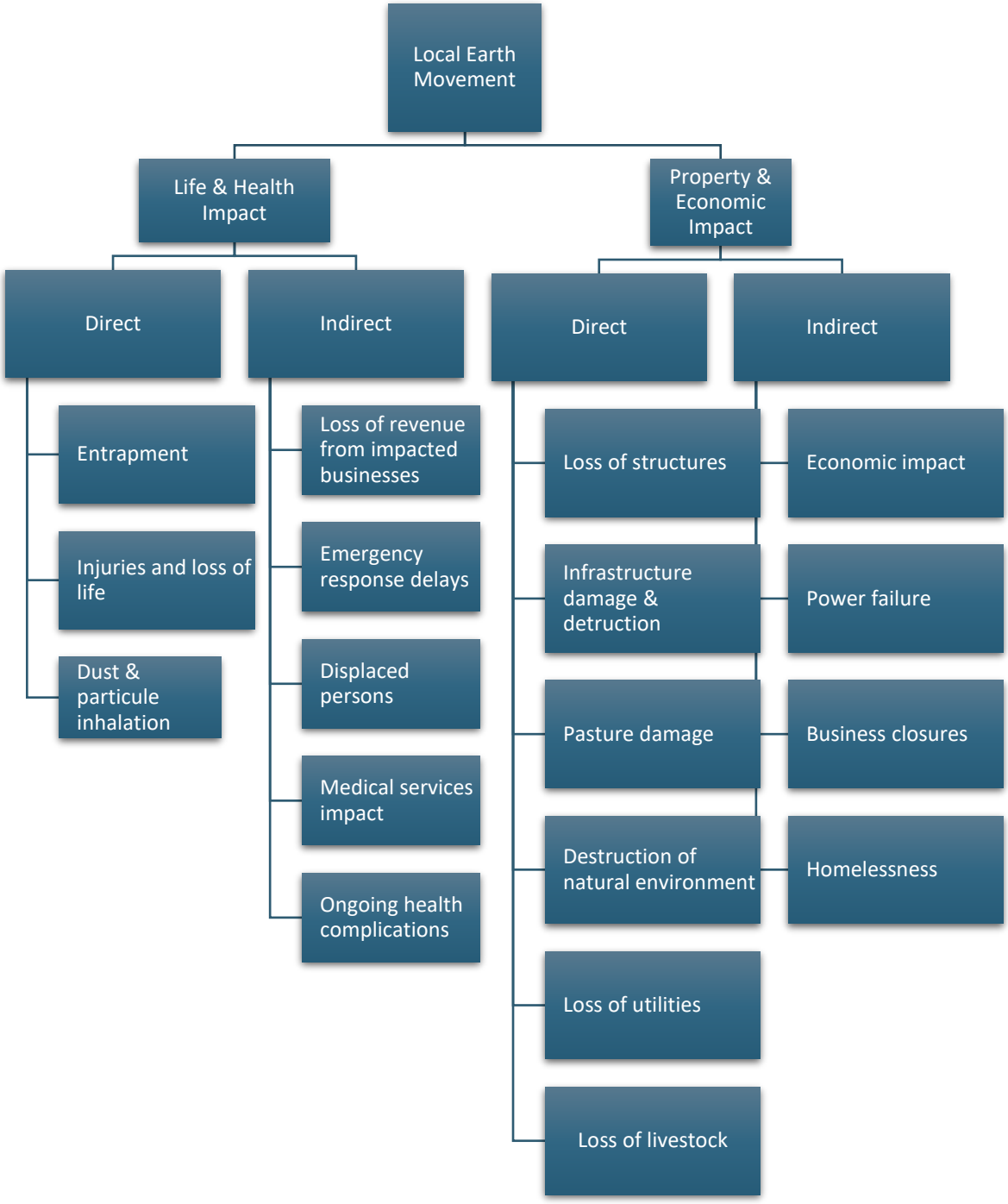


Figure 23: Potential Local Earth Movement Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 46: Local Earth Movement EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal	Impact in the incident area expected to be minimal.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Minimal	Impact to property, facilities, and infrastructure could be minimal. Facilities, Infrastructure, and personnel could be minimally affected.
Delivery of Services	Minimal	Minimal impact on services expected.
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.9 Severe Thunderstorms & Tornadoes

Table 47: Severe Thunderstorms & Tornadoes Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Severe Thunderstorms & Tornadoes	Highly Likely	Catastrophic	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; and impact of climate change,

- the probability of a future severe thunderstorm & tornado is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact is **Catastrophic** (high number of deaths/injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by a severe thunderstorm or tornado occurrence is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for severe thunderstorms & tornadoes is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

For this plan, **severe thunderstorms** consist of rain-bearing clouds and have the potential to produce hail, heavy rain, high winds, strong winds, thunderstorm winds, and lightning. Thunderstorms often precede tornadoes.

Hail is defined as a form of frozen precipitation. A hail event occurs when hail that is three-quarters of an inch falls in a given area, or when smaller hailstones “result in fatalities, injuries, or significant damage”. In Delaware, data on past hail episodes show that Delaware reported experiencing 64 hail events between 2000 and 2022. These events resulted in $100,000 in reported property damage and $300,000 in reported crop damage. There were no reported deaths and no reported injuries.

A **high wind event** is defined as sustained winds of 40 miles per hour (mph) or greater for a minimum of one hour or the occurrence of 58 mph winds (or a different windspeed that is defined locally) for any duration. This classification is not used for “severe local storms or winter storm events”. In Delaware, data on past high wind episodes show that Delaware reported experiencing 65 high wind events between 2000 and 2022. These events resulted in $12,717,000 in reported property damage and 2 reported injuries. There was no reported crop damage and no reported deaths.

A **strong wind event** is defined as “non-convective winds” that gust at less than 58 miles per hour (mph) or when sustained winds less than 40 mph result in “fatality, injury, or damage”. These mph thresholds may change depending on location. In Delaware, data on past strong wind episodes show that Delaware reported experiencing 154 strong wind events between 2000 and 2022. These events resulted in $1,768,250 in reported property damage, 4 reported deaths, and 3 reported injuries. There was no reported crop damage.

Inland counties/parishes which experience strong winds/damage associated with tropical cyclones will be documented under the Tropical Depression or Tropical Storm category, as appropriate, not as a Strong Wind event.

A **thunderstorm wind** event is defined as when “winds, arising from convection (occurring within 30 minutes of lightning being observed or detected)” have speeds that are 58 miles per hour (mph) or greater or winds that are less than 58 mph result in fatality, injury, or other damage.

In Delaware, data on past thunderstorm wind episodes show that Delaware reported experiencing 323 thunderstorm wind events between 2000 and 2022. These events resulted in $3,233,000 in reported property damage, $201,000 in reported crop damage, and 4 reported injuries. There were no reported deaths.

A **tornado** is defined as a "violently rotating column of air [that extends to/from] a cumuliform cloud or underneath a cumuliform cloud to the ground". A tornado should also produce visible effects, "such as dust/dirt rotational markings/swirls, or structural or vegetative damage or disturbance." In Delaware, data on past tornado episodes show that Delaware reported experiencing 12 tornado events between 2000 and 2022. These events resulted in $1,450,000 in reported property damage and 5 reported injuries. There was no reported crop damage and no reported deaths.

Altogether, the elements identified within this profile have caused $25.353M of property damage, $501,000 of crop damage, 1 direct and 5 indirect deaths, and 22 direct and 3 indirect injuries and is predicted to have similar impacts in the future.

Table 48: Historical Severe Thunderstorm & Tornado Impacts per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	-	1	$1,121,170.00	-	-	-
Inland Sussex	1	1	$1,176,020.00	-	1	1
Kent	-	2	$1,908,770.00	$100,000.00	3	1
New Castle	-	13	$16,372,320.00	-	1	1
Sussex	-	5	$4,774,510.00	$401,000.00	-	-
2000-2022 TOTAL	**1**	**22**	**$25,352,790.00**	**$501,000.00**	**5**	**3**

Table 49: Historical Severe Thunderstorm & Tornado Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2000	-	-	$166,000.00	-	-	-
2001	-	3	$528,000.00	-	-	-
2002	-	-	$515,000.00	-	-	-
2003	-	1	$11,333,200.00	-	-	-
2004	1	1	$1,844,000.00	-	-	-
2005	-	-	$293,000.00	-	-	-
2006	-	-	$1,188,000.00	-	-	-
2007	-	-	$1,078,000.00	-	-	-
2008	-	1	$1,456,500.00	-	1	3
2009	-	-	$1,933,500.00	$500,000.00	-	-
2010	-	-	$189,000.00	-	-	-
2011	-	-	$1,260,000.00	$1,000.00	1	-
2012	-	4	$2,325,000.00	-	2	-
2013	-	-	$260,000.00	-	-	-

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2014	-	2	$415,000.00	-	-	-
2015	-	-	$533,500.00	-	-	-
2016	-	1	$35,030.00	-	-	-
2017	-	3	$60.00	-	1	-
2019	-	4	-	-	-	-
2021	-	2	-	-	-	-
22-yr TOTAL	**1**	**22**	**$25,352,790.00**	**$501,000.00**	**5**	**3**
Annual Forecast	*0.05*	*1.00*	*$1,152,399.55*	*$22,772.73*	*0.23*	*0.14*

According to NOAA NCEI, from 2000-2022 Delaware has experienced 576 days of severe thunderstorms and tornadoes and has an annual forecast of roughly 26.18 days of severe thunderstorms & tornadoes per year.

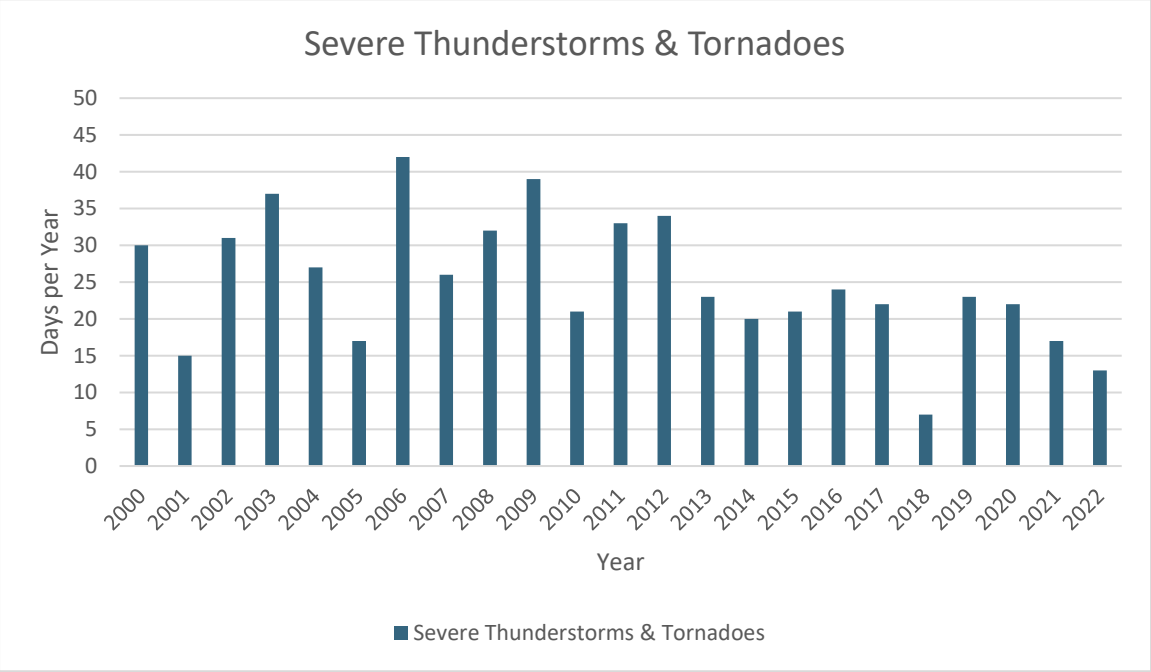


Figure 24: Days of Severe Thunderstorms & Tornadoes

The following maps show the historic hail, wind, and tornado paths between 2000-2022 in the State of Delaware.

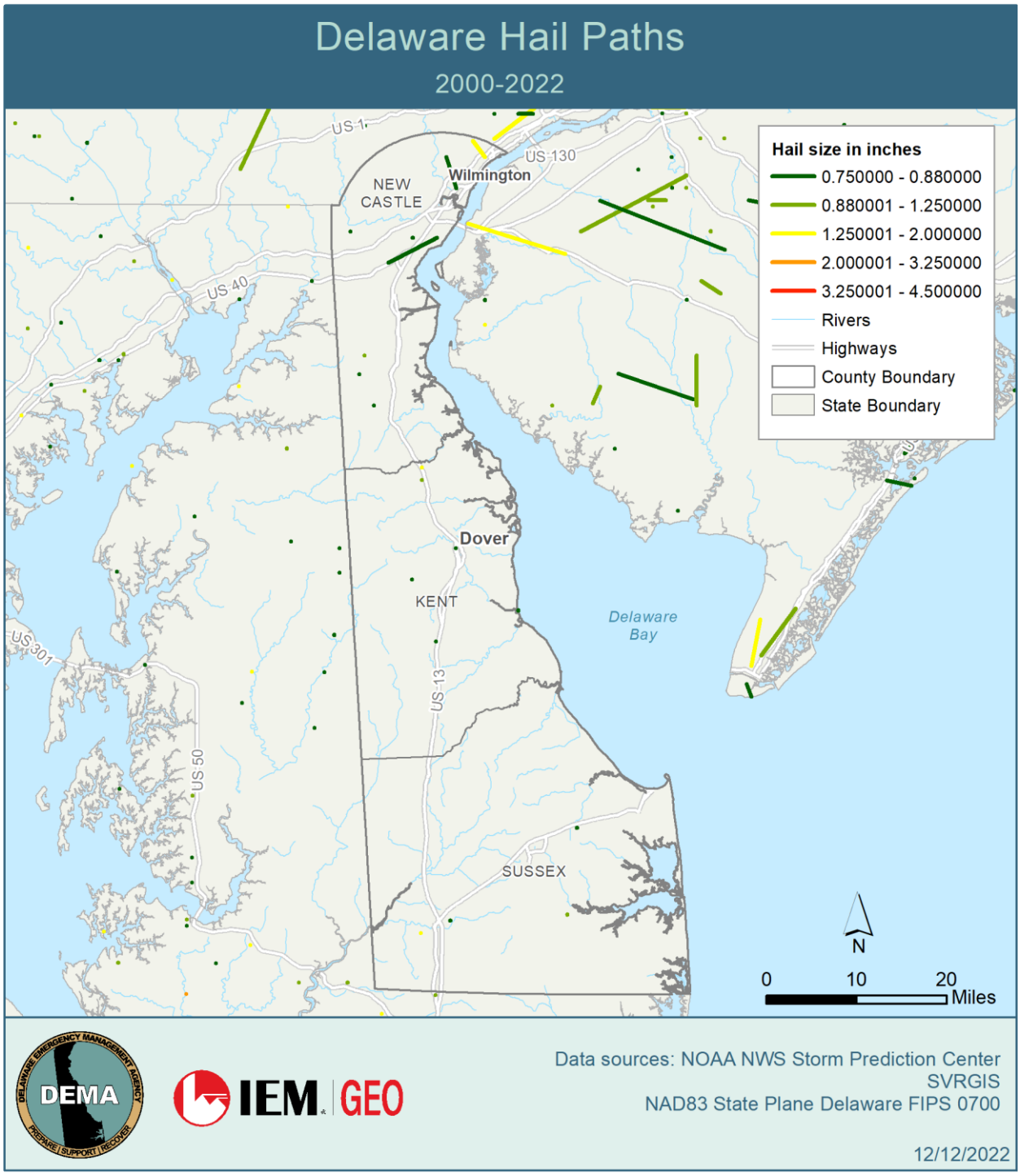


Figure 25: 2000-2022 Hail Paths

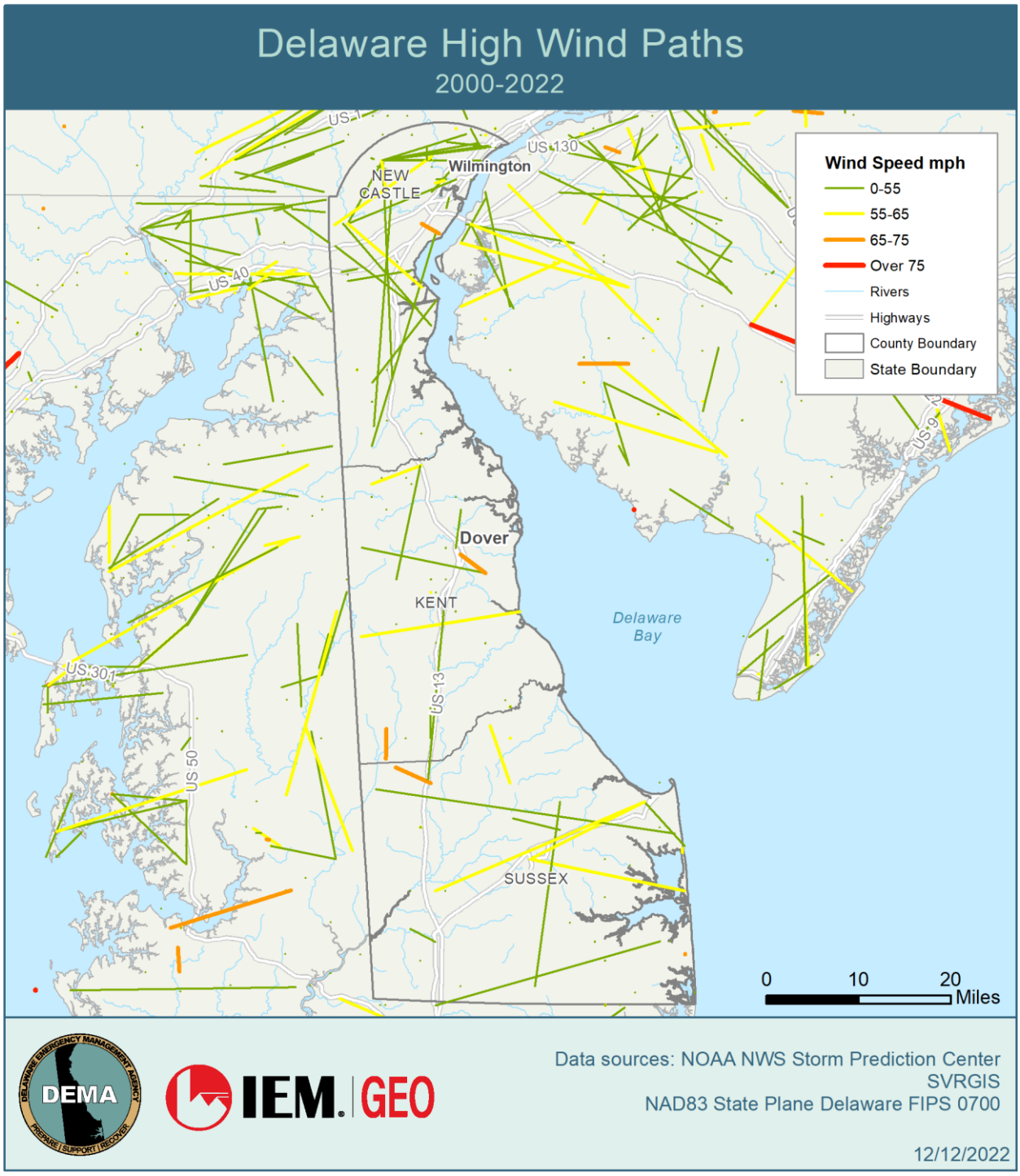


Figure 26: 2000-2022 High Wind Paths

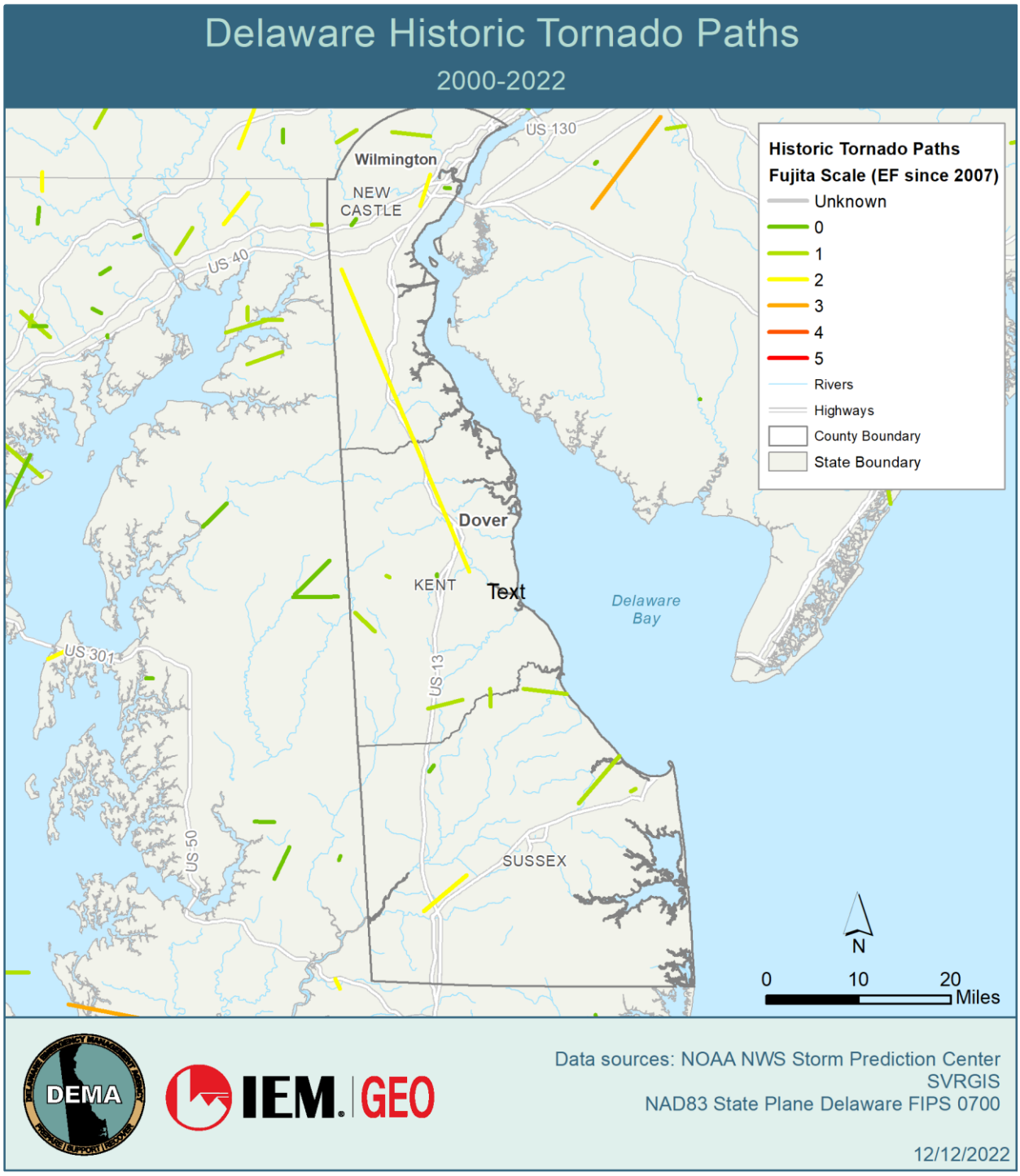


Figure 27: 2000-2022 Tornado Paths

The National Weather Service uses the Storm Prediction Center (SPC) activity levels to represent severe thunderstorm outlooks. The Storm Prediction Center uses a five-level risk system to define potential severe thunderstorm risks. Level 1 is the lowest and Level 5 is the highest. Level 1 and Level 2 are the most commonly issued. Level 3 through Level 5 become progressively rarer. A higher risk level means a higher probability of severe weather impacting your area. Another way to think about the risks is using a color-risk scale. From the lowest risk to highest the colors transition from green to yellow to orange to red to pink.

- **A Level 1 (Marginal) Risk** of severe weather is issued when strong to borderline severe storms are possible. Thunderstorms are expected to be limited in their organization and/or only last a short amount of time. Severe thunderstorm coverage is anticipated to be very low along with marginal intensity.

- **A Level 2 (Slight/Standard) Risk** indicates the potential for severe thunderstorms. Coverage of severe thunderstorms is anticipated to be isolated to widely scattered. This is issued for most of our 'dryline' days where the number of storms will be limited, but quite intense. Varying levels of intensity are possible and depend on the severe weather setup. This risk is the 'standard' risk level for most of our severe weather days.

- **A Level 3 (Enhanced) Risk** indicates scattered to numerous severe thunderstorms are possible. This risk is issued when a higher concentration of severe weather is possible. Varying levels of severe weather intensity are expected, but the risk for higher-end severe weather increases. Depending on the setup there could be an increased risk for several tornadoes (some strong), giant hail, and/or widespread damaging wind gusts.

- **A Level 4 (Moderate) Risk** is rare and indicates increased confidence in a significant severe weather event. Numerous severe thunderstorms are expected with widespread severe weather. Several strong, long-lived tornadoes, giant hail, and/or widespread destructive wind gusts are expected. The specific hazards will depend on the setup, but intense severe weather is likely.

- **A Level 5 (High) Risk** is very rare. A High Risk is issued only when confidence is high in a major outbreak of tornadoes and/or a long-lived derecho with hurricane-force wind gusts. Violent, long-lived tornadoes, giant hail, and/or an intense derecho are probable. While any of the above risk levels can and do produce high-end impacts, a high-risk issuance is a precursor to a 'Red Letter' day with devastating impacts.

Although most new homes and buildings are built to resist the effects of all but the strongest thunderstorms, several mobile and manufactured home parks and vehicles remain vulnerable. Thousands of homes and vehicles can be damaged by high winds, hail, and lightning in a single storm, causing millions of dollars in damages.

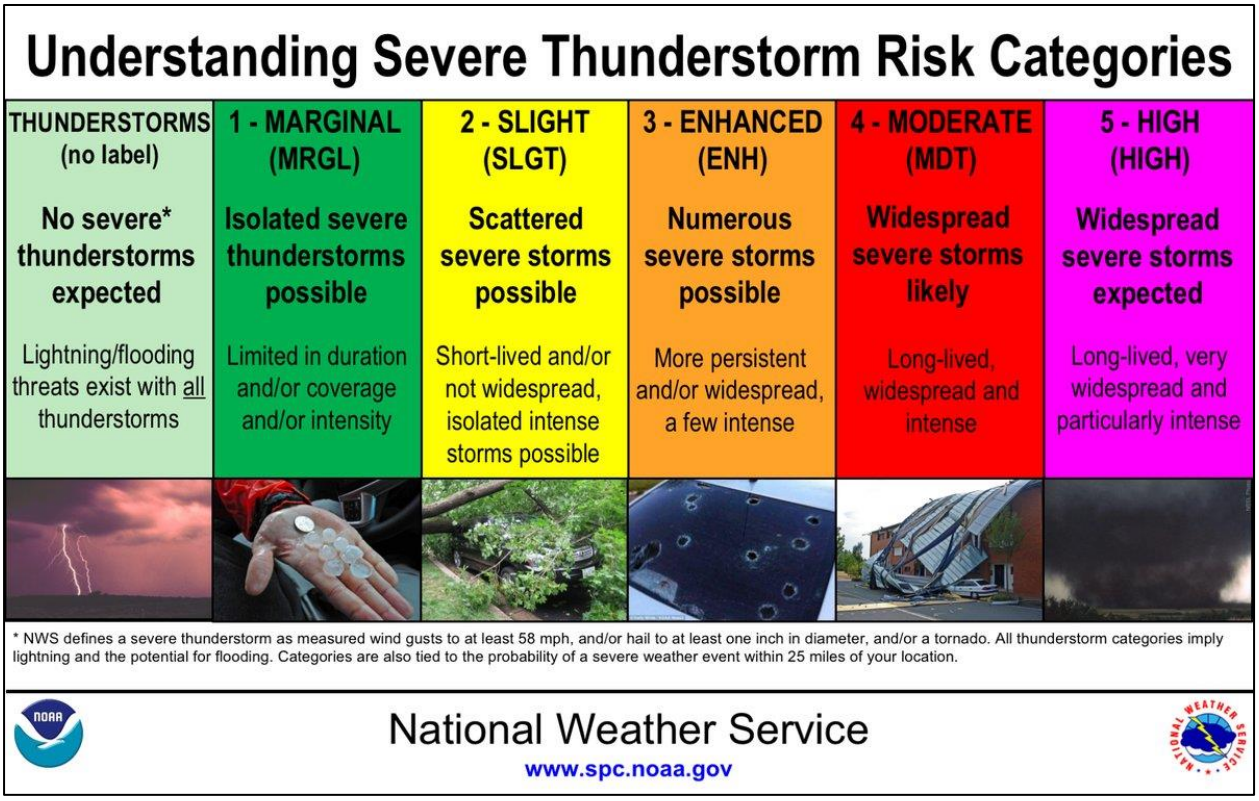


Figure 28: Severe Thunderstorm Intensity Scale

The Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornadoes during the observed time period via the damage they cause. The scale considers how most structures are designed and is thought to be an accurate representation of the surface wind speeds in the most violent tornadoes. The EF Scale, implemented in 2007, considers more variables than the original Fujita Scale (F-Scale) when assigning a wind speed rating to a tornado, incorporating 28 damage indicators such as building type, structures and trees. For each damage indicator, there are 8 degrees of damage ranging from the beginning of visible damage to complete destruction of the damage indicator. The original F-scale did not take these details into account. The original F-Scale historical data base will not change.

Table 50: Tornado Classification Scale

Enhanced Fujita & Fujita Scales			
EF-0	65-85 mph winds	**F-0**	40-72 mph winds
EF-1	86-110 mph	**F-1**	73-112 mph
EF-2	111-135 mph	**F-2**	113-157 mph
EF-3	136-165 mph	**F-3**	158- 206 mph
EF-4	166-200 mph	**F-4**	207- 260 mph
EF-5	>200 mph	**F-5**	261-318 mph

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

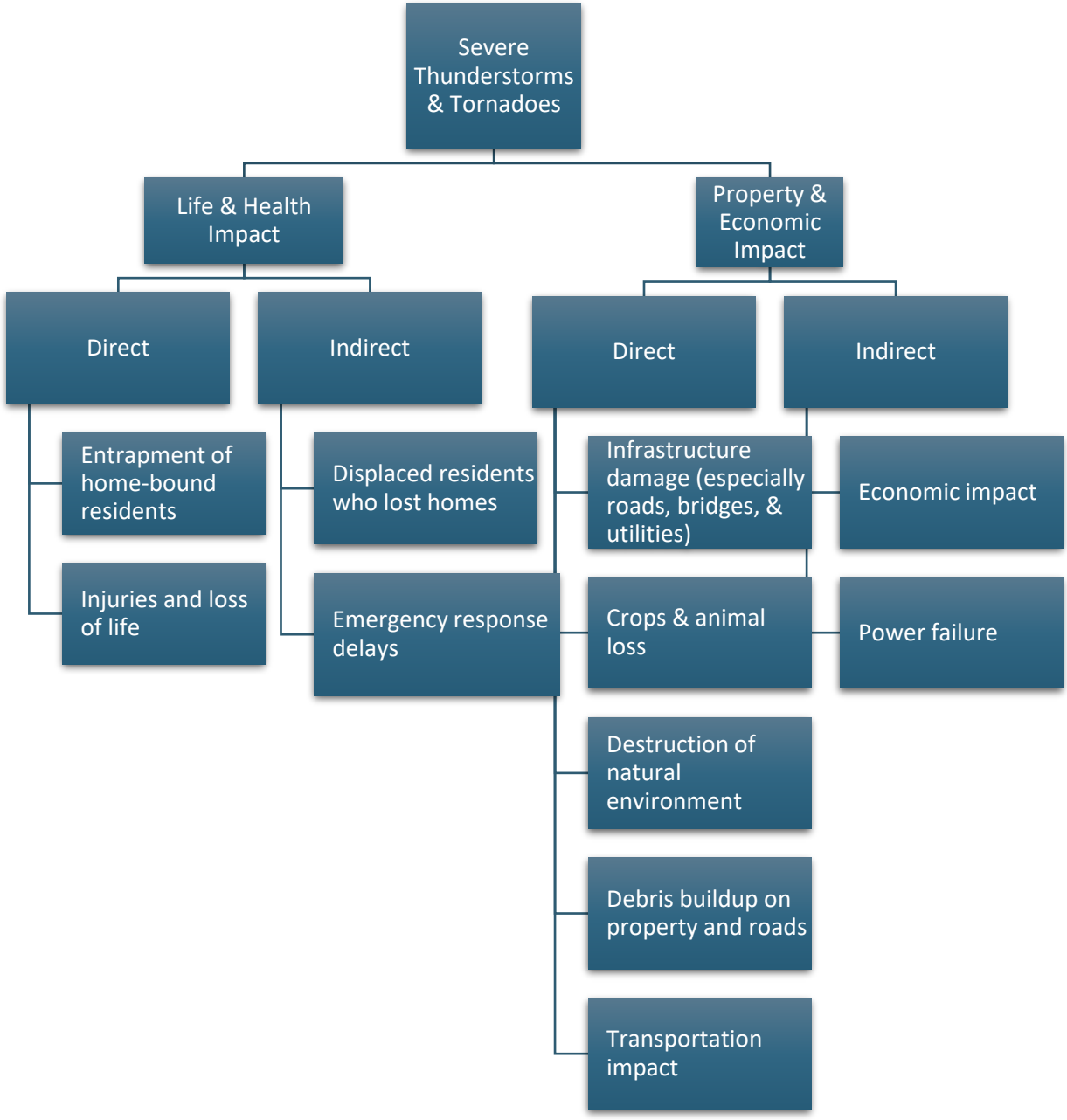


Figure 29: Potential Severe Thunderstorm & Tornado Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 51: Severe Thunderstorms & Tornadoes EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.10 Severe Winter Weather

Table 52: Severe Winter Weather Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Severe Winter Weather	Highly Likely	Catastrophic	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; and impact of climate change,

- the probability of a future severe winter weather event is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of severe winter weather is **Catastrophic** (high number of deaths/injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by severe winter weather is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for severe winter weather is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

A **blizzard** is defined as a winter storm which has both sustained 35 miles per hour (mph) winds or frequent gusts of wind along with snow (falling or blowing) that reduces visibility to less than a quarter of a mile for a minimum of three consecutive hours. In Delaware, data on past blizzard episodes show that Delaware reported experiencing 2 blizzard events between 2000 and 2022. These events resulted in no reported property damage, no reported crop damage, no reported injuries, and no reported deaths.

A **frost/freeze event** is defined as when the surface air temperature reaches 32 degrees Fahrenheit or colder, or when ice crystals (frost) form on a surface for long enough that it causes an impact during the local growing season. In Delaware, data on past frost/freeze episodes show that Delaware reported experiencing 3 frost/freeze events between 2000 and 2022. These events resulted in no reported property damage, no reported crop damage, no reported injuries, and no reported deaths.

A **heavy snow event** is defined as “snow accumulation meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria”. The particular amount of snowfall for these warning criteria varies by location. In Delaware, data on past heavy snow episodes show that Delaware reported experiencing 34 heavy snow events between 2000 and 2022. These events resulted in 138 reported injuries. There was no reported property damage, no reported crop damage, and no reported deaths.

An **ice storm** is defined as ice accumulations from freezing rain that meet or exceed locally/regionally defined warning criteria, this is typically a quarter to a half an inch. This event does not get reported/recorded if additional forms of precipitation (such as snow) are mixed in with freezing rain. In Delaware, data on past ice storm episodes show that Delaware reported experiencing 2 ice storm events between 2000 and 2022. These events resulted in 5 reported injuries. There was no reported property damage, no reported crop damage, and no reported deaths.

Sleet is defined as frozen precipitation that becomes frozen while falling. This is different from freezing rain, which only freezes once it hits a surface. A sleet event occurs when sleet accumulations meet or exceed locally/regionally defined warning criteria, which is typically a half an inch or greater. In Delaware, data on past sleet episodes show that Delaware reported experiencing 5 sleet events between 2000 and 2022. These events resulted in no reported property damage, no reported crop damage, no reported injuries, and no reported deaths.

A **winter storm event** is defined as a "winter weather event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements". In Delaware, data on past winter storm episodes show that Delaware reported experiencing 34 winter storm events between 2000 and 2022. These events resulted in $13,300,000 in reported property damage, 6 reported deaths, and 146 reported injuries. There was no reported crop damage.

A **winter weather event** is defined as a "winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. In Delaware, data on past winter weather episodes show that Delaware reported experiencing 154 winter weather events between 2000 and 2022. These events resulted in 3 reported deaths and 271 reported injuries. There was no reported property damage and no reported crop damage.

Altogether, the elements identified within this profile have caused $13.300M of property damage, 5 direct and 4 indirect deaths, and 97 direct and 463 indirect injuries and is predicted to have similar impacts in the future.

Table 53: Historical Severe Winter Weather Impacts per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	-	-	$2,500,000.00	-	16	-
Inland Sussex	1	15	$3,300,000.00	-	123	1
Kent	-	6	$3,150,000.00	-	149	1
New Castle	4	76	$4,350,000.00	-	175	2
Sussex	-	-	-	-	-	-
2000-2022 TOTAL	**5**	**97**	**$13,300,000.00**	**-**	**463**	**4**

Table 54: Historical Severe Winter Weather Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2000	-	55	-	-	1	-
2003	-	-	$4,400,000.00	-	-	-
2007	3	-	-	-	56	-
2008	-	6	-	-	45	1
2009	-	35	$100,000.00	-	12	-
2010	2	-	$8,800,000.00	-	25	-
2011	-	-	-	-	28	1
2012	-	-	-	-	11	1
2013	-	-	-	-	33	-
2014	-	-	-	-	162	-
2015	-	-	-	-	85	-
2016	-	1	-	-	-	1

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2017	-	-	-	-	6	-
22-yr TOTAL	**5**	**97**	**$13,300,000.00**	**-**	**463**	**4**
Annual Forecast	*0.23*	*4.41*	*$604,545.45*	*$0.00*	*21.09*	*0.18*

According to NOAA NCEI, from 2000-2022 Delaware has experienced 205 days of severe winter weather and has an annual forecast of roughly 9.32 days of severe winter weather per year,

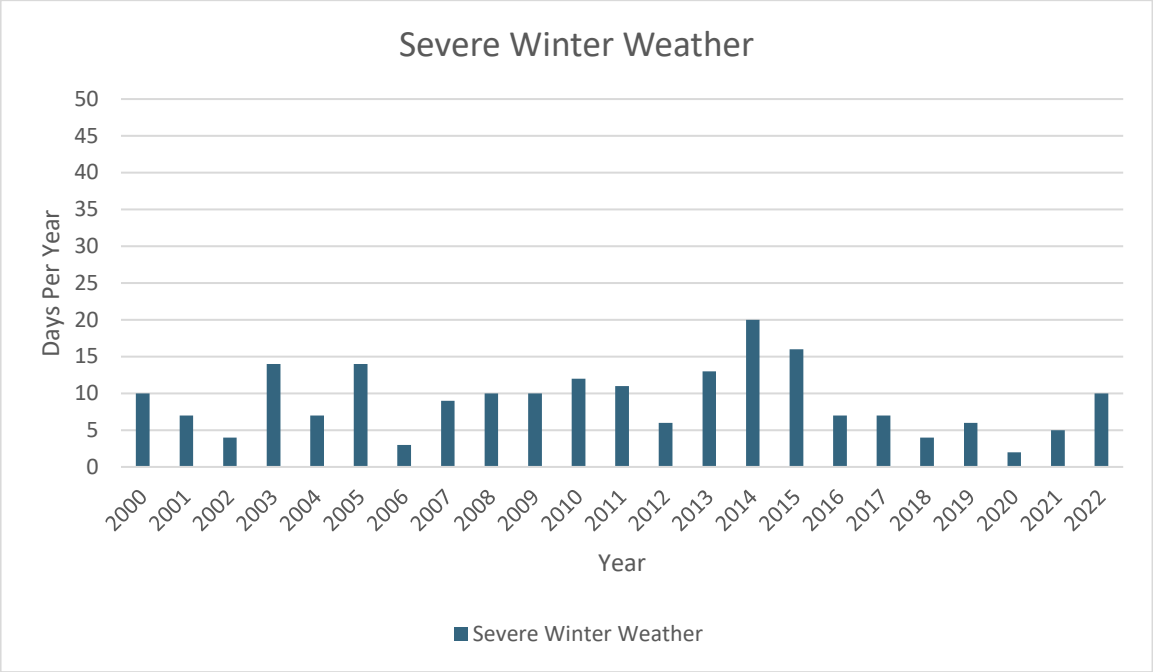


Figure 30: Days of Severe Winter Weather

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

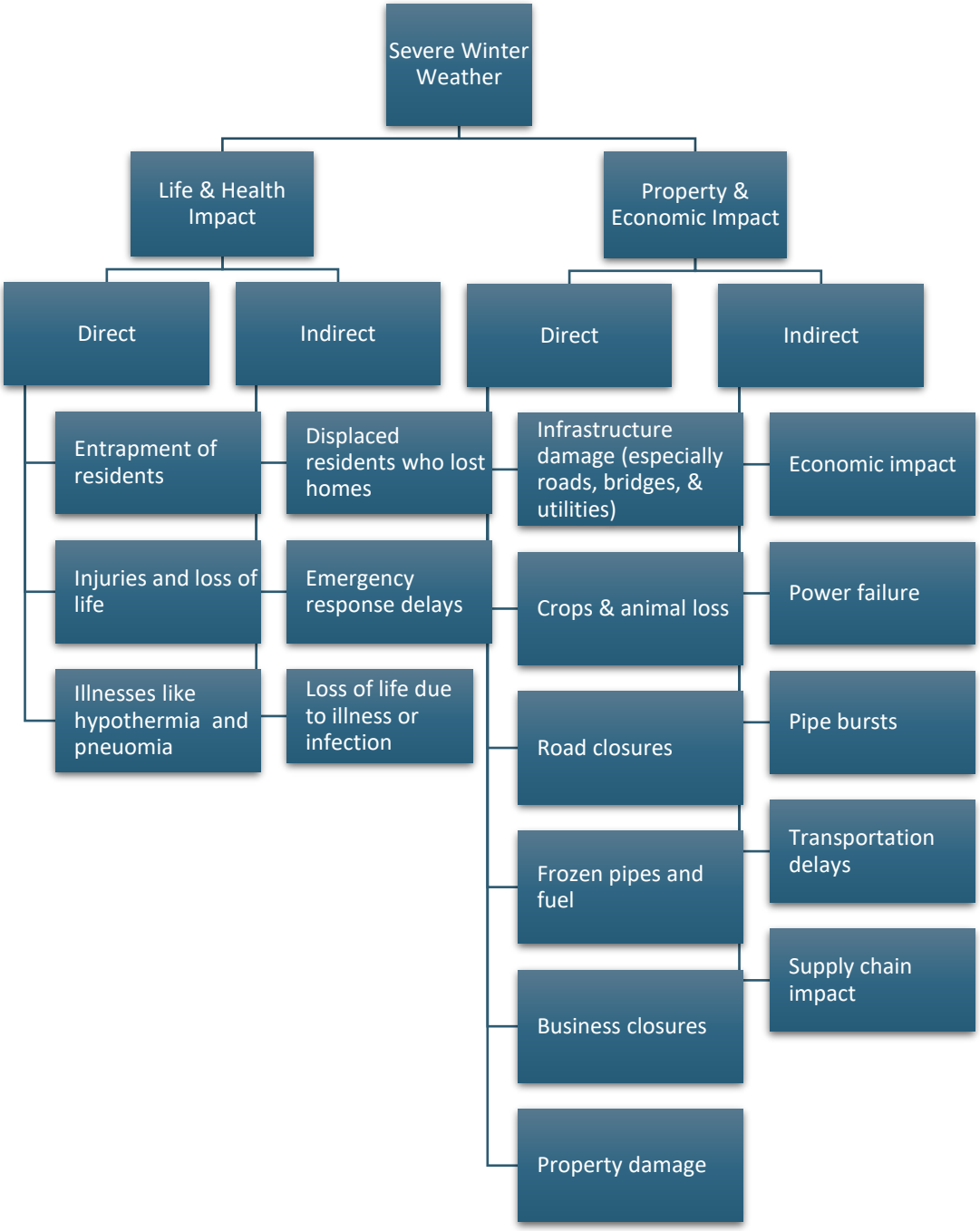


Figure 31: Potential Severe Winter Weather Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 55: Severe Winter Weather EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.11 Tropical Cyclones

Table 56: Tropical Cyclone Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Tropical Cyclones	Highly Likely	Catastrophic	Catastrophic	Extensive	Major

Based on historical, scenario, and exposure analysis; changes in development; impact of climate change; and classification as a coastal zone,

- the probability of a future tropical cyclone event is **Highly Likely**, with a probable recurrence interval of less than one year;
- the potential life impact of a tropical cyclone is **Catastrophic** (high number of deaths/injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by a tropical cyclone occurrence is **Extensive** (75 to 100 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for a tropical cyclone is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

A **hurricane** is defined as a tropical storm with sustained surface winds that are 74 mph or greater. In Delaware, data on past hurricane episodes show that Delaware reported experiencing 0 hurricane events between 2000 and 2022. These events resulted in no reported property damage, no reported crop damage, no reported injuries, and no reported deaths.

A **tropical storm** is defined as a tropical cyclone that has winds between 39 and 73 miles per hour (mph). In Delaware, data on past tropical storm episodes show that Delaware reported experiencing 5 tropical storm events between 2000 and 2022. These events resulted in $17,750,000 in reported property damage. There was no reported crop damage, no reported deaths, and no reported injuries.

Altogether, the elements identified within this profile have caused $17.750M property damage, 0 deaths, and 0 injuries and is predicted to have similar impacts in the future.

Table 57: Historical Tropical Cyclone Impacts per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	-	-	$1,250,000.00	-	-	-
Inland Sussex	-	-	$8,000,000.00	-	-	-
Kent	-	-	$8,500,000.00	-	-	-
New Castle	-	-	-	-	-	-
Sussex	-	-	-	-	-	-
2000-2022 TOTAL	**-**	**-**	**$17,750,000.00**	**-**	**-**	**-**

Table 58: Historical Tropical Cyclone Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage
2003	-	-	$17,750,000.00	-

Year	Deaths	Injuries	Property Damage	Crop Damage
22-yr TOTAL	**-**	**-**	**$17,750,000.00**	**-**
Annual Forecast	*-*	*-*	*$806,818.18*	*-*

According to NOAA NCEI, from 2000-2022 Delaware has experienced 5 days of tropical cyclones and has an annual forecast of 0.23 days of tropical cyclones per year.

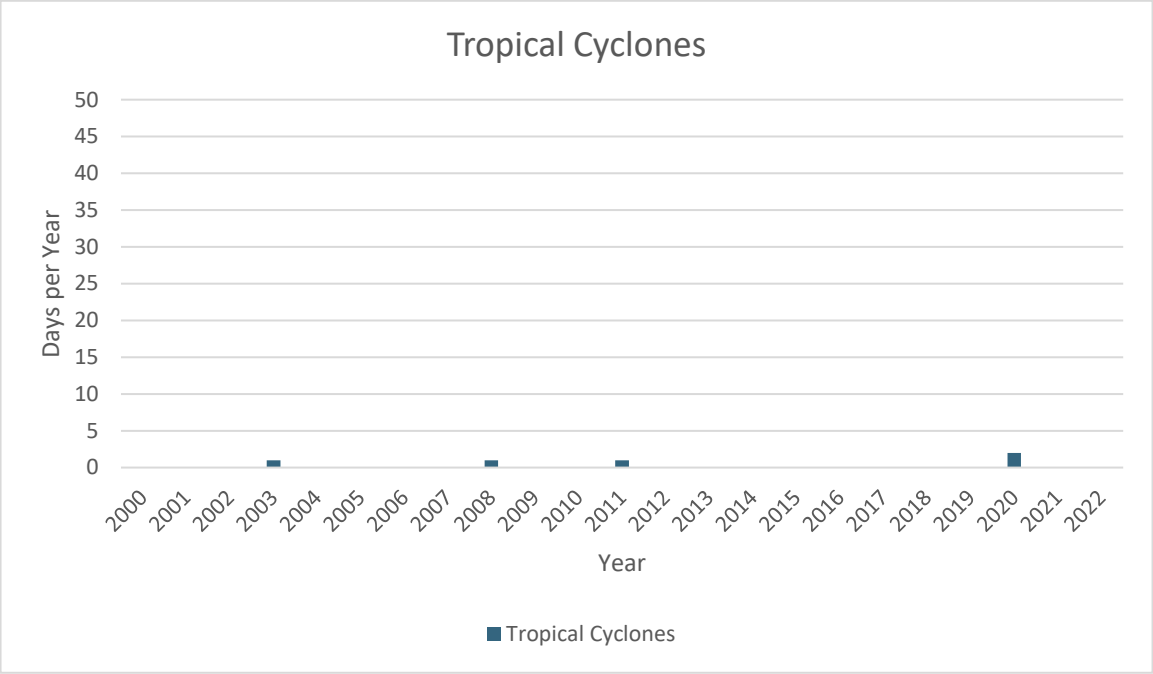


Figure 32: Days of Tropical Cyclones

The following figure shows the paths of historic cyclones since 2000.

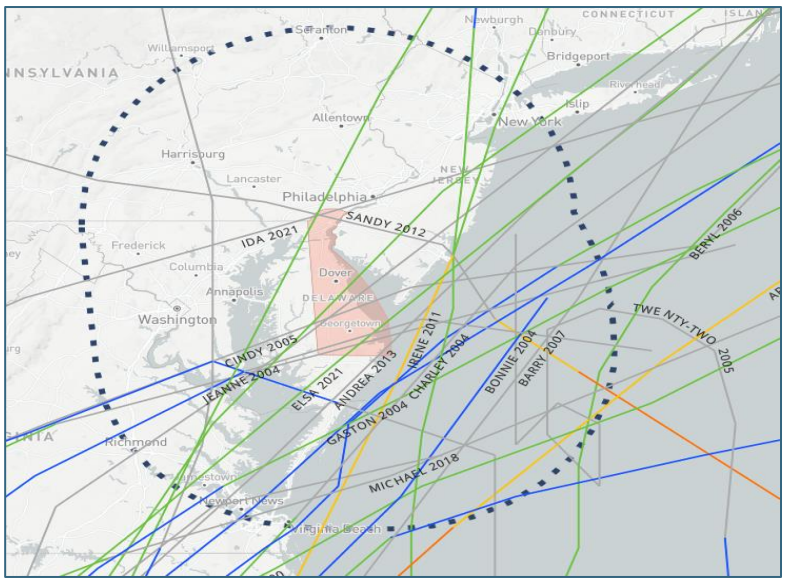


Figure 33: Historical Hurricane Paths

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

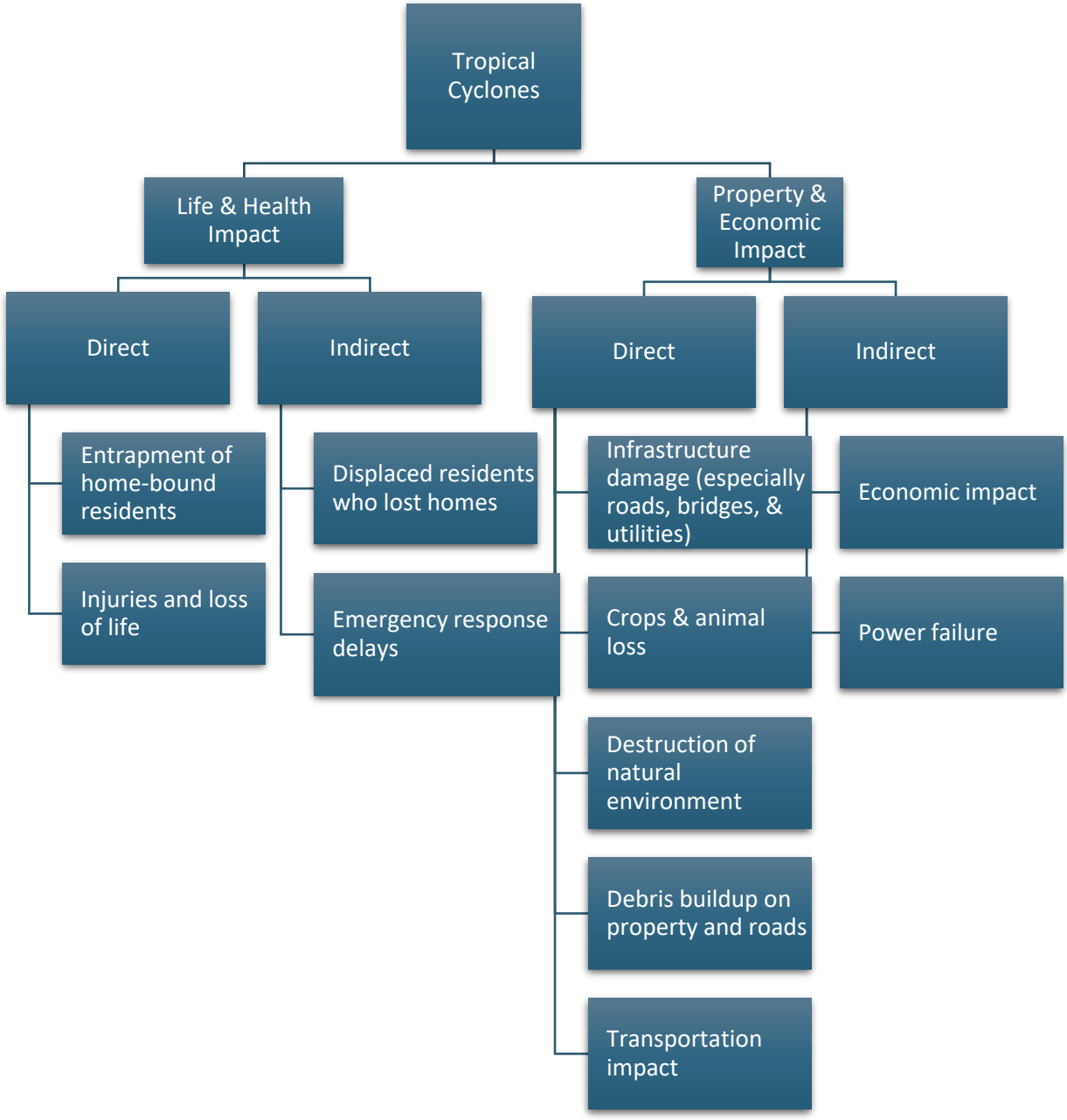


Figure 34: Potential Tropical Cyclone Impacts

FEMA Hazus 6.0 was used to predict a probabilistic hurricane wind scenario in Delaware. The vulnerability analysis for hurricanes was completed using the Hazus probabilistic hurricane wind model for 10-, 20-, 50-, 100-, 200-, 500-, and 1000-year return intervals. This assessment is based on using Hazus 6.0 default inventory along with the 7 local datasets identified in the methodology section. As noted, before, Hazus 6.0 integrates building data from the National Structure Inventory and population data from the 2020 Census. The dollar values shown in this report are based on aggregated building data based on occupancy types.

Annualized hurricane losses were developed by aggregating potential losses for 10-, 20-, 50-, 100-, 200-, 500-, and 1000- year return periods.

The full report is in **Appendix B**, but below are summary tables of the results.

Table 59: Direct Economic Losses for Buildings: Annualized Losses (in dollars)

Capital Stock Losses	Cost Building Damage	Contents Damage Cost	Inventory Loss	Loss Ratio %
Kent	6,558,000	2,008,000	96,000	.02
New Castle	11,495,000	3,033,000	54,000	.01
Sussex	30,507,000	10,905,000	456,000	.05
Total	**48,561,000**	**15,946,000**	**606,000**	**.02**

Table 60: Number of Buildings by Damage Level (sum of all occupancy types for all 3 counties)

Return Period	None	Minor	Moderate	Severe	Destruction	Total
10 Years	404,474	182	4	0	0	404,659
20 Years	404,014	601	42	1	0	404,659
50 Years	397,065	6,763	774	31	25	404,659
100 Years	380,076	20,897	3,300	189	198	404,659
200 Years	342,678	52,191	8,522	625	642	404,659
500 Years	314,236	66,251	18,913	2,797	2,462	404,659
1000 Years	268,586	94,514	30,696	5,811	5,052	404,659

Table 61: Expected Building Damage Count by Occupancy Type for 100 Year Return Period (sum of all 3 counties)

Building Type	None	Minor	Moderate	Severe	Destruction	Total
Agriculture	2,567	244	61	26	2	2,900
Commercial	25,831	1,076	262	29	0	27,198
Education	610	16	2	0	0	628
Government	589	25	5	0	0	619
Industrial	4,962	175	41	6	0	5184
Religion	1,789	93	15	1	0	1,898
Residential	343,726	19,267	2,913	125	1,295	366,226
Total	380,074	20,896	3,299	187	197	404,653

Table 62: Number of Residential Buildings compared with Total Buildings Damaged/ by Return Period

Return Period	Damage Level									
	Minor		Moderate		Severe		Destruction		Total	
	Residential	Total	Residential	Total	Residential	Total	Residential	Total	Residential	Total
10 Years	100	182	4	4	0	0	0	0	104	186
20 Years	531	601	39	42	1	1	0	0	571	644
50 Years	6,247	6763	708	774	21	31	25	25	7,001	7,593
100 Years	19,267	20,897	2,913	3,300	125	189	195	198	22,500	24,584
200 Years	48,179	52,191	7,337	8,522	407	625	630	642	56,553	61,980
500 Years	61,376	66,251	16,493	18,913	2,128	2,797	2,428	2,482	82,425	90,443
1000 Years	87,682	94,514	26,729	30,696	4,412	5,811	4,970	5,052	123,793	136,073

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 63: Tropical Cyclones EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal	Impact in the incident area expected to be minimal.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Minimal	Impact to property, facilities, and infrastructure could be minimal. Facilities, Infrastructure, and personnel could be minimally affected.
Delivery of Services	Minimal	Minimal impact on services expected.
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expectation of economic conditions being impacted.
Public Confidence in Jurisdiction's Governance	Minimal	No change in confidence in jurisdictions governance.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.2.12 Wildfire & Smoldering Fires

Table 64: Wildfire & Smoldering Fire Profile Overview

Overview					
Hazard	**Probability**	**Life Impact**	**Property Impact**	**Location**	**Maximum Intensity**
Wildfire & Smoldering Fires	Likely	Limited	Catastrophic	Minimal	Major

Based on historical, scenario, and exposure analysis; changes in development; and impact of climate change,

- the probability of a future fire event is **Likely**, with a probable recurrence interval of 1-10 years;
- the potential life impact of a wildfire & smoldering fire is **Limited** (minor injuries) and potential property impact is **Catastrophic** (more than 50% of property in affected area damaged/destroyed and/or complete shutdown of critical facilities for 30 days or more);
- the potential geographic location affected by a wildfire or smoldering fire occurrence is **Minimal** (10 to 25 percent of State or frequent single-point occurrences); and
- the potential maximum intensity for wildfires & smoldering fires is considered **Major** (a major classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months).

A **wildfire** is defined as any fire that "consumes the natural fuels and spreads in response to its environment" and "causes one or more fatalities, one or more significant injuries, and/or property damage". "In general, forest fires smaller than 100 acres, grassland or rangeland fires smaller than 300 acres, and wildland use fires not actively managed as wildfires" are not reported/recorded as wildfire events. In Delaware, data on past wildfire episodes show that Delaware reported experiencing 14 wildfire events between 2000 and 2022. These events resulted in $5,000 in reported property damage and 2 reported injuries. There was no reported crop damage and no reported deaths.

Smoldering fires are a slow, low-temperature, flameless form of combustion. The most important fuels involved in smoldering fires are coal and peat. Peat is decaying plant material that is found under the ground in some cool, wet regions. Once ignited, these fires are particularly difficult to extinguish despite extensive rains, weather changes or firefighting attempts, and can persist for long periods of time (months, years), spreading deep (15 feet) and over extensive areas of forest subsurface.

The characteristic temperature, spread rate, and heat released during smoldering are low compared to flaming fires. Smoldering peat fires creep at a speed of 3 feet per day.

Smoldering fires can be ignited by natural causes such as wildfires, lightning strikes, self-heating or anthropogenic factors, e.g., slash and burn, arson, mining activities, or waste incineration. The most typical scenario for peat fires is when a fast-flaming wildfire sweeps over a region burning the surface vegetation and igniting the peat if dry enough. The peat then smolders for a much longer time.

Altogether, the elements identified within this profile have caused $5,000 of property damage, 0 deaths, and 1 direct and 1 indirect injury and is predicted to have similar impacts in the future. Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future.

Table 65: Historical Wildfire & Smoldering Fire Impacts per County

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Delaware Beaches	-	-	-	-	-	-

Location	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
Inland Sussex	-	1	$5,000.00	-	-	-
Kent	-	-	-	-	-	-
New Castle	-	-	-	-	1	-
Sussex	-	-	-	-	-	-
2000- 2022 TOTAL	-	**1**	**$5,000.00**	**-**	**1**	-

Table 66: Historical Wildfire & Smoldering Fire Life & Property Impacts

Year	Deaths	Injuries	Property Damage	Crop Damage	Injuries-Indirect	Deaths-Indirect
2006	-	1	$5,000.00	-	-	-
2012	-	-	**-**	**-**	1	-
22-yr TOTAL	**-**	**1**	**$5,000.00**	**-**	**1**	**-**
Annual Forecast	-	*.05*	*$227.27*	*$0.00*	*.05*	-

According to NOAA NCEI, from 2000-2022 Delaware has experienced 14 days related to wildfires and smoldering fires and has an annual forecast of roughly 0.64 days of wildfires & smoldering fires per year.

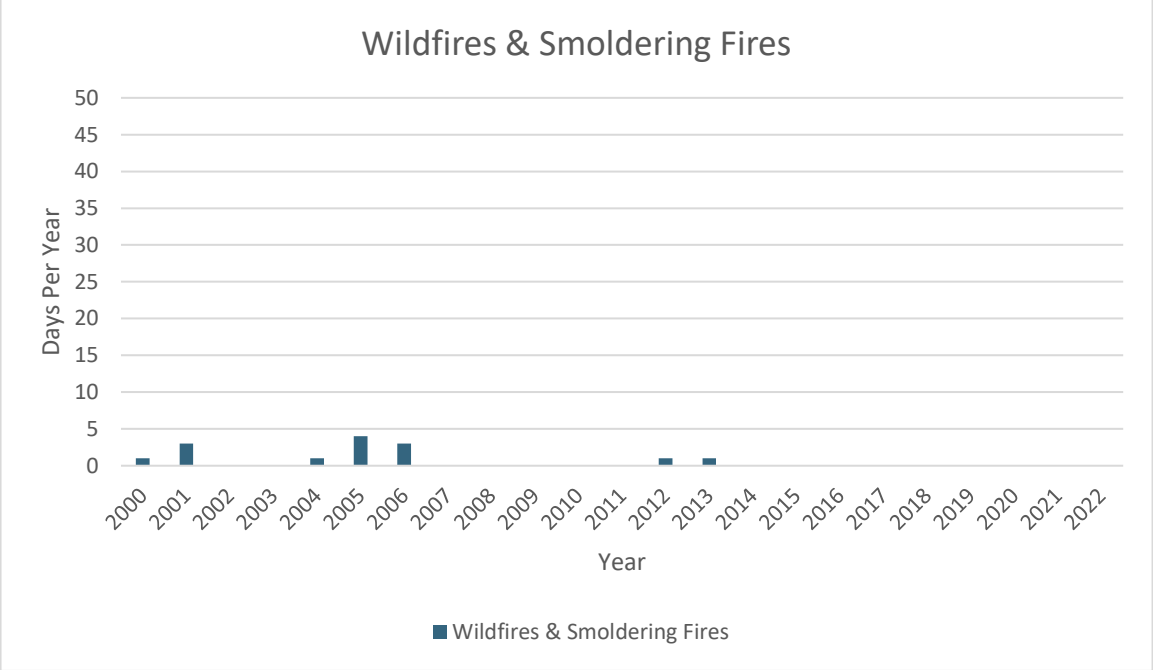


Figure 35: Days of Wildfires & Smoldering Fires

The Delaware Forest Service (DFS) maintains a cooperative agreement with the U.S. Forest Service to assist local volunteer fire companies with wildfire suppression and prevention on Delaware's one million acres of undeveloped land, which includes approximately 380,000 forested acres.

Delaware's 60 volunteer fire companies are vital to the Delaware Forest Service because they provide much of the manpower and resources to fight wildfires in the state. The Delaware Forest Service maintains two fire equipment supply caches, one at Blackbird State Forest and one at Redden State Forest. In addition to these supply caches, the Delaware Forest Service has two type 6 engines, three fire plows, and four UTVs with slip-in tanks that are available to help with wildfires.

Each year, the Wildland Fire Program offers cost-share assistance grants and technical assistance to communities to reduce the danger of wildland fires. These funds are used to control phragmites in high priority areas through mechanical and chemical treatments. The Delaware Forest Service has had great success in controlling phragmites in the First State through a systematic spraying and mowing cycle over a three- to four-year period. In FY20, six grants totaling $20,000 were funded with State Fire Assistance dollars. This assistance, combined with funding from our partners, has helped treat a total of 5,506 acres statewide.[4]

Burn Probability

Burn Probability (BP) represents the annual probability of wildfire burning in a specific location. It is referred to as Wildfire Likelihood in the Wildfire Risk to Communities web application. Vegetation and wildland fuels data from LANDFIRE 2014 (version 1.4.0) form the foundation for the Wildfire Risk to Communities data. As such, the data presented here reflect landscape conditions as of the end of 2014. Delaware's BP is represented in the following map.

[4] Wildland Fire Program - Delaware Department of Agriculture - State of Delaware

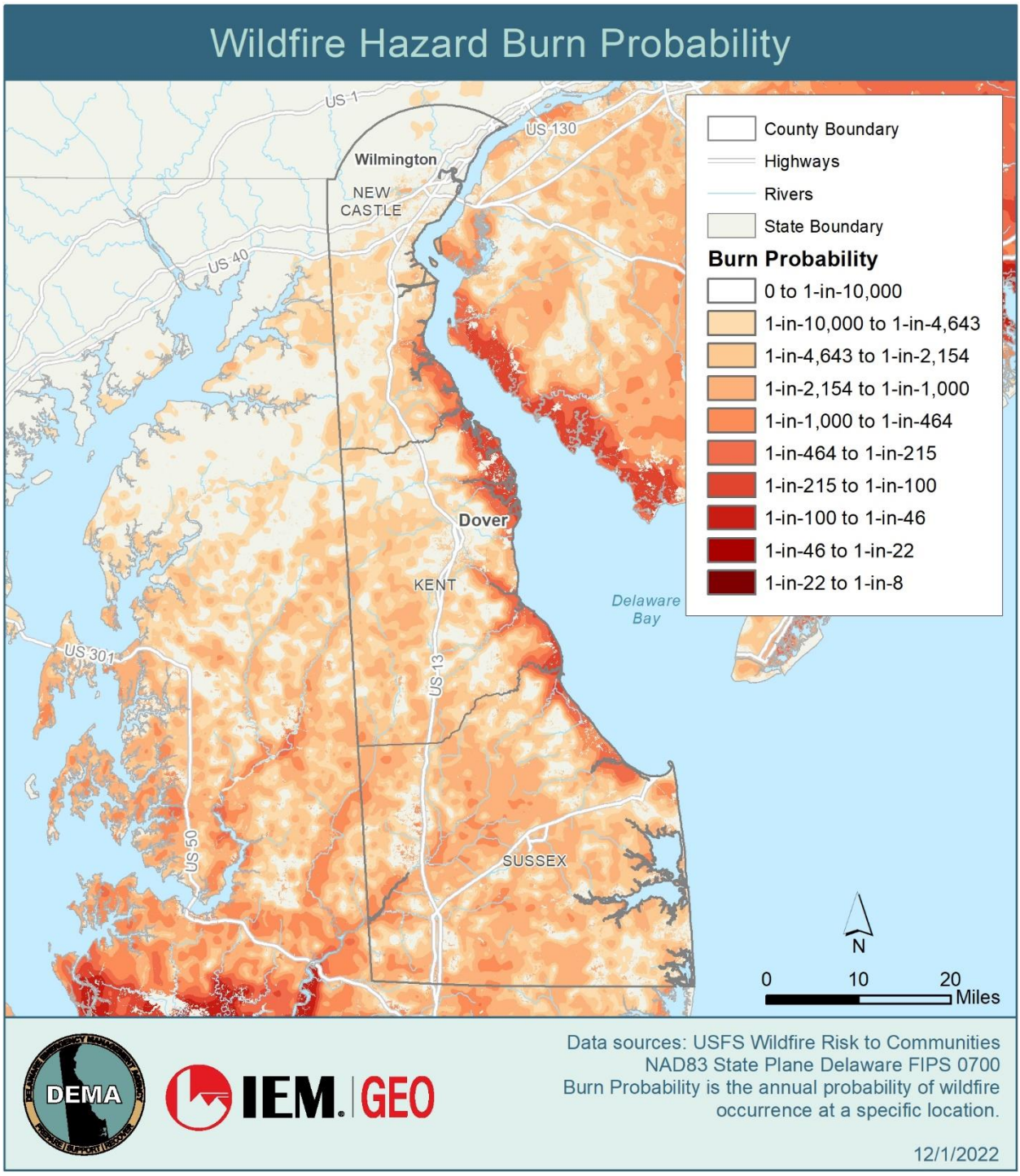


Figure 36: Delaware Burn Probability (BP) Map

Wildfire Hazard Potential

Wildfire Hazard Potential (WHP) is an index that quantifies the relative potential for wildfire that may be difficult to control, used as a measure to help prioritize where fuel treatments may be needed. Delaware's WHP is represented in the following map.

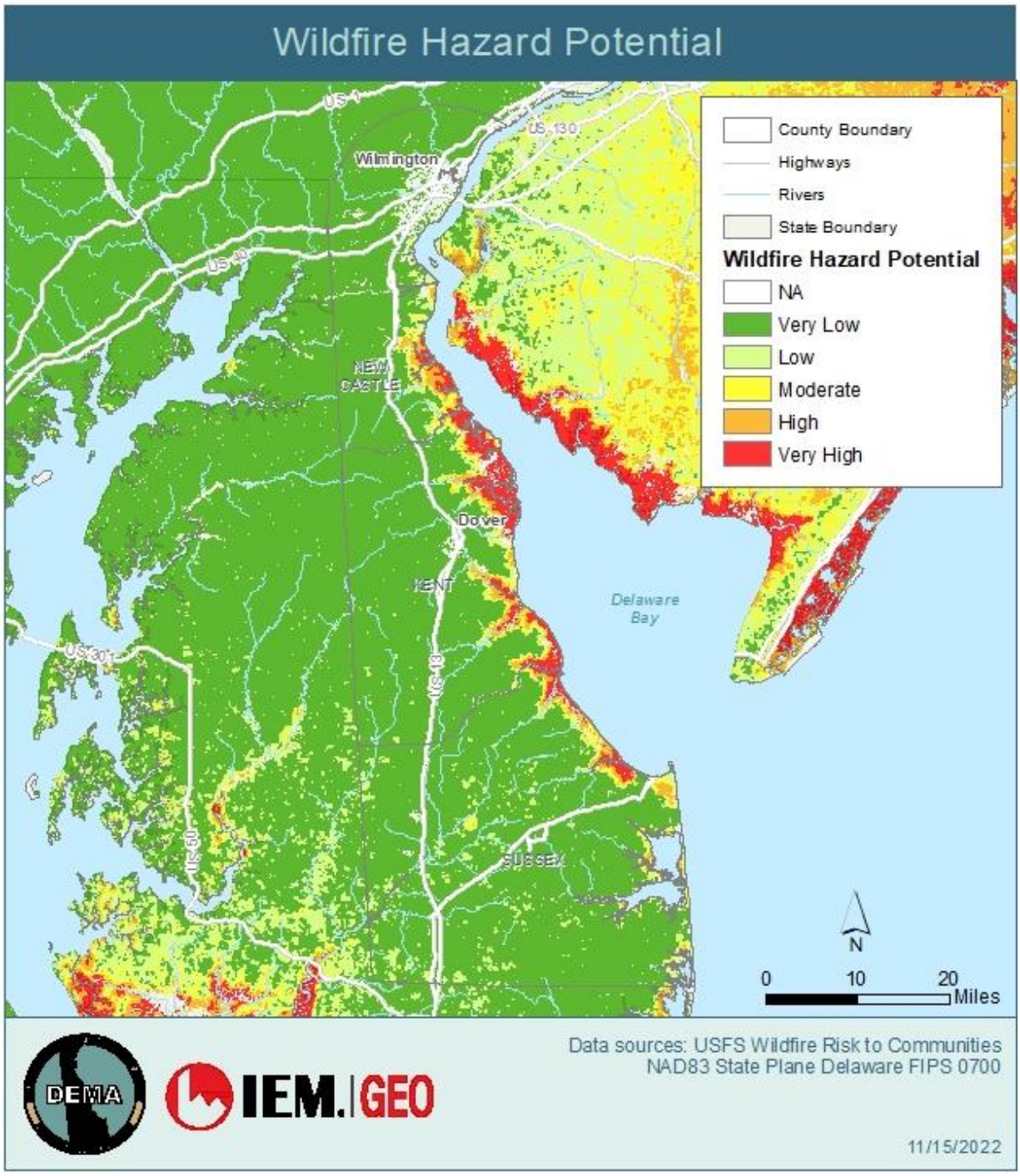


Figure 37: Delaware Wildfire Hazard Potential (WHP) Map

Based on historic impacts the past 22 years, it can be expected that similar impacts will occur in the future. Potential impacts are described in the following figure.

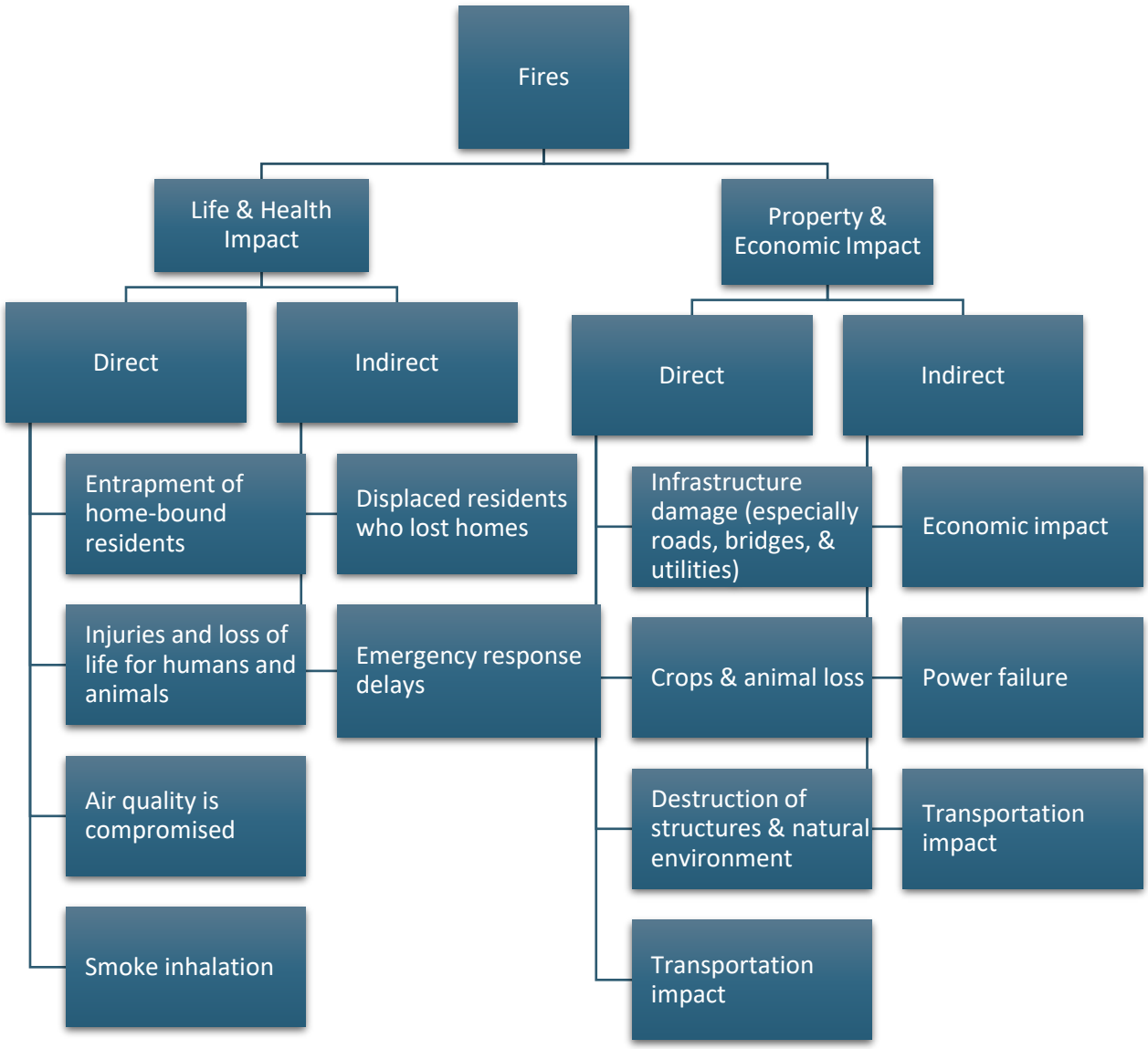


Figure 38: Potential Wildfire & Smolder Fire Impacts

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 67: Wildfires & Smoldering Fires EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and

Subject	Ranking	Impacts
		moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The location, range of anticipated intensities, frequency, and/or duration of the hazard is projected to remain the same, if not increase due to climate change. Potential changes in vulnerability are determined by the factors identified in **Section 4.4.3. Factors that Affect Vulnerabilities**.

4.3 Non-Natural Hazard Profiles

Besides natural hazards, the State of Delaware is vulnerable to non-natural hazards as well.

Non-Natural Hazards	
Public Health Concerns • animal/crop/plant disease • invasive species • human health incident & pandemic • opioid (substance) addiction • housing instability	Terrorism/ Violence Extremism • contamination • energy release • radiological terrorism • electromagnetic pulse • conventional terrorism • biological terrorism • agroterrorism • chemical terrorism • cyber terrorism • WMD
HazMAT • fixed HazMAT incident • fixed radiological incident • transportation HazMAT incident	Transportation/Infrastructure Incident • air transportation incident • highway transportation incident • railway transportation incident • water transportation incident • pipeline transportation incident • energy pipeline failures • communication failures • dam failure • structural failure • structural fire
Other Incidents • enemy attack • public disorder & civil disturbance • mass migration (i.e. evacuations) • school emergencies • supply chain disruption of service (cyber, physical)	Evolving threats: • space weather • cyber threats • autonomous robotics • electric vehicle hazards

Probability of Future Events and Impacts

It can be expected that future impacts and number of events will remain consistent with that of previous occurrences. However, the challenges posed by changes in development and climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels, could significantly alter the types and magnitudes of hazards affecting states in the future.

The probability, location, intensity and impacts of hazards will change over time. Climate change, including changes in temperature, intensity, hazard distribution or frequency of weather events, may increase vulnerability to these hazards in the future. Based on historical knowledge and current conditions, it can be expected that all hazards will see a rise in scope, scale, and frequency of events on a yearly basis.

Disaster costs are predicted to increase on a yearly basis as well. These costs include: physical damage to residential, commercial, and municipal buildings; material assets (content) within buildings; time element losses such as business interruption or loss of living quarters; damage to vehicles and boats; public assets including roads, bridges, levees; electrical infrastructure and offshore energy platforms; agricultural assets including crops, livestock, and commercial timber; and wildfire suppression costs, among others.

However, these disaster costs do not consider losses to natural capital or environmental degradation; mental or physical healthcare related costs; the value of a statistical life (VSL); or supply chain, contingent business interruption costs. Therefore, our estimates should be considered conservative with respect to what is truly lost but cannot be completely measured due to a lack of consistently available data.

The increase in population and material wealth over the last several decades are an important cause for the rising costs. These trends are further complicated by the fact that much of the growth has taken place in vulnerable areas like coasts, the wildland urban interface, or floodplains. Vulnerability is especially high where building codes are insufficient for reducing damage from extreme events.

To further profile the details regarding each hazard, hazard summaries were developed. The following sections profile these hazards.

4.3.1 Public Health Concerns

Public health concerns include:

- animal/crop/plant disease
- invasive species
- human health incident & pandemic
- opioid (substance) addiction
- housing instability

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 68: Public Health Concerns EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.

Subject	Ranking	Impacts
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

An outbreak of disease that can be transmitted from animal to animal or plant to plant represents an **animal/crop/plant disease**. The disease outbreak will likely have a significant economic implication or public health impact.

The introduction of some high consequence diseases may severely limit or eliminate the ability to move, slaughter, and export animals and animal products. The outbreak will have widespread economic and societal implications for the state. Response and recovery to infectious animal disease outbreaks will be lengthy, and many producers may never be able to return to business. There will be many indirect effects on the economy. In Delaware, where the poultry industry is essential to the state's economy, the detection of an infectious disease among poultry (i.e., avian influenza), could cause significant damage to the market.

Crop/plant pest infestations can cause widespread crop/plant loss and severe economic hardship on farmers and landowners and related businesses. Once infestation occurs, the pest may become endemic, causing repeated losses in subsequent growing years. Loss of production will affect all related industries, such as fuel, food, synthetics, processors, etc. Every year the Delaware Department of Agriculture conducts numerous animal disease investigations.

Executive Order 13112 defines an **invasive species** as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Such harm includes:

- Reduce native diversity by competing for resources, such as space, sunlight, water and minerals.
- Alter soil conditions by secreting chemicals that inhibit the germination or growth of other species
- Alter nutrient cycling by changing the amount, composition, or rate of decay of leaf litter.
- May hybridize with native species.
- Disrupt natural communities and change habitat structure for other organisms such as birds, mammals, turtles, fish and frogs.

The National Invasive Species Management Plan (NISMP) further defines an invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health." In response to invasive species, the State created The Delaware Invasive Species Council (DISC), a non-regulatory organization comprised of nearly 100 scientists, botanists, and ecologists with government, academia, and nonprofit organizations. Their mission is to protect Delaware's ecosystems by preventing the introduction and reducing the impact of non-native species.

A **human health incident** is an incident related to human disease is defined as a medical, health, or environmental threat to the general public (such as contamination, epidemics, and vector-borne diseases). Public health action to control infectious diseases in the 21st century is based on the 19th century discovery of microorganisms as the cause of many serious diseases (e.g., cholera and TB). Disease control in a population resulted from improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs. Scientific and technologic advances played a major role in each of these areas and are the foundation for today's disease surveillance systems. The Centers for Disease Control and Prevention (CDC) established a National Notifiable Diseases Surveillance System that enables states and other jurisdictions to share infectious and non-infectious disease-related data. Reporting is mandated by state laws or regulations and should follow uniform reporting criteria (i.e., specific reporting timeframes, confirmatory testing, and clinical information).

As of 2017, over eighty (80) infectious diseases were designated as notifiable at the national level. The list of notifiable diseases varies by state and may include diseases that are reportable only at the state level.

The Delaware Division of Public Health (DPH) works to protect Delawareans from infectious disease threats through disease surveillance, investigation of suspect outbreaks, public education, and establishing partnerships with important stakeholders. Additionally, there are programs that guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Delaware. In recent years, although there have been no major incidents of diseases with high percentages of loss of life or severe illness, emerging and re-emerging infectious diseases represent an ongoing threat.

While vaccines are available for many diseases, Delawareans remain vulnerable to other diseases known and unknown. Vaccine-preventable diseases have recently re-emerged as a public health threat, especially to infants and school-age children, due to anti-vaccination movements. This means that diseases that were previously declared as eliminated, such as measles, now represent a public health concern. On the other hand, antimicrobial resistance has been increasing in recent years. Patients that are infected with these resistant bacteria or viruses may have worse health outcomes, life-threatening infections, and increased health care costs. Another public health threat includes high consequence infectious diseases which represent a wide variety of diseases that could significantly impact communities and health care settings, such as diseases with high epidemic or pandemic potential (i.e., novel influenza), high person-to-person transmission rates (i.e., smallpox), or low-incidence and high death rates (i.e., rabies; viral hemorrhagic fevers). Moreover, the alarming increase in opioid abuse and injection drug use poses an increased risk for the transmission of blood-borne pathogens such as Hepatitis C and HIV.

A **pandemic human disease** is defined as a disease that has spread around the world to many people. The word, “pandemic”, means that a disease has caused illness in a person on nearly every continent. A pandemic will have widespread economic and societal implications for the State and require a lengthy recovery time. The Coronavirus (COVID-19) pandemic was the most recent pandemic to impact the State of Delaware.

Opioid addiction, or opioid use disorder, is a physical and psychological reliance on opioid drugs that can negatively affect physical health, mental health, and general way of life. Opioid addiction is a long-lasting (chronic) disease that can cause major health, social, and economic problems.

According to the DEA’s 2020 Intelligence Report, the primary drug threats identified in Delaware are illicit opioids, cocaine, controlled prescription drugs, and methamphetamine. The determination of drug threats in Delaware considers a variety of factors including: availability, threat to public health, community impact, attendant crime, enforcement activity, seizures, drug abuse and treatment statistics, and propensity for abuse.

Investigations and data indicators clearly demonstrate that illicit opioids remain the most significant drug threat in Delaware, where its proximity to Philadelphia, the primary source area for inexpensive and highly potent illicit opioids, increases the vulnerability of its citizens to addiction, overdose, and violence commonly associated with drug trafficking and distribution.

Housing instability encompasses a number of challenges, such as having trouble paying rent, overcrowding, moving frequently, or spending the bulk of household income on housing. A study examining the association between neighborhood housing insecurity and health outcomes had the following results[5]:

- High levels of housing instability induced by high levels of foreclosed properties in certain neighborhoods were strongly associated with more health problems among residents.

[5] Wang K. Housing Instability and Socioeconomic Disparities in Health: Evidence from the U.S. Economic Recession. J Racial Ethn Health Disparities. 2022 Dec;9(6):2451-2467. doi: 10.1007/s40615-021-01181-7. Epub 2021 Nov 26. PMID: 34837164.

- Adverse health conditions in lower income neighborhoods remained longer and became stronger than those in higher income neighborhoods.
- While multiple health problems plagued all income levels in white tracts, more severe and worsening pre-existing health problems appeared in lower income minority tracts.
- Neighborhood housing instability generated by mortgage foreclosures was strongly associated with heart-related diseases, particularly in middle-income White neighborhoods, and mental health problems, particularly in upper-income Hispanic tracts.
- Mental health problems were the most common health conditions during the U.S. economic recession.

Housing instability can be impacted by and lead to unemployment and homelessness, putting additional stress on the State's economy.

4.3.2 Terrorism

The topic of terrorism includes:

- contamination
- energy release
- radiological terrorism
- electromagnetic pulse
- conventional terrorism
- biological terrorism
- agroterrorism
- chemical terrorism
- cyber terrorism
- WMD (chemical agents, radiological agents, biological agents)

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 69: Terrorism EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.

Subject	Ranking	Impacts
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

The Delaware Information and Analysis Center (DIAC) is Delaware's fusion center. Formed in 2005, the DIAC's all hazards approach is committed to the detection, prevention, investigation and response to criminal and terrorist activity through a variety of resources. The DIAC is able to achieve its core mission of combating terrorism and major crime through the cooperative efforts of law enforcement agencies and private sector partners through its website, www.dediac.org. The DIAC website is a secure communication tool allowing members from law enforcement, public safety, government, and the private sector to receive and exchange information.

The Federal Emergency Management Agency, in its guidance on integrating human-caused hazards into state and local hazard mitigation plans (FEMA Publication 386-7), has established a set of categories that can be applied to the profiling of intentional acts of terrorism. These categories are contamination; energy release (i.e., explosives, arson, etc.); and disruption of a service.

Contamination, as it relates to terrorist activity, refers to the intentional release of chemical, biological or radiological agents, as well as nuclear hazards. Contamination can apply to human and animal life, a geographic area, agriculture/food supplies (as in "agriterrorism"), and even the electronic world of computers and information via the Internet and e-mail (as in "cyberterrorism.")

According to Jane's Chem-Bio Handbook, chemical agents are liquid or aerosol contaminants that can be dispersed using sprayers or other aerosol generators, by liquids vaporizing from puddles or containers, or munitions. Chemical agents may pose viable threats for hours to weeks depending on the agent used and the conditions which exist at the exposed area. This type of hazard is especially volatile as contamination can be carried beyond the initial target zone by persons, vehicles, water and even the wind. Chemicals may also be corrosive or otherwise damaging over time, if not dealt with appropriately. Biological agents are liquid or solid contaminants that can be dispersed using sprayers or aerosol generators, or by point or line sources such as munitions, covert deposits or moving sprayers. Biological hazards may pose a danger for a period of hours to years, depending on the type of agent used and the conditions in which it exists. Contamination can be spread via water and/or wind, and infection can be spread via humans and/or animals.

FEMA's Radiological Emergency Management Course states that radiological agents can also be dispersed using sprayers or aerosol generators, or by point or line sources such as munitions, covert deposits and moving sprayers. Radiological contaminants may remain hazardous for seconds to years depending on the material used. The initial effects of a radiological attack are likely to be localized to the site of the attack; however, depending on meteorological conditions, the subsequent behavior of contaminants may become more dynamic. Nuclear hazards include the detonation of a nuclear device underground, on the Earth's surface, in the air, or at a high altitude. Heat flashes and blast waves resulting from a detonation would last for seconds, however nuclear radiation and fallout hazards can continue on for years. In addition, an electromagnetic pulse, resulting from a high-altitude detonation and lasting for a few seconds, can affect unprotected electronic systems. The initial light, heat and blast effects of a subsurface, ground or air burst are static and are determined by the device's characteristics. The fallout of radioactive contaminants may be dynamic depending on meteorological conditions.

Energy release refers primarily to the use of explosive devices, such as conventional bombs, and incendiary operations such as arson attacks. The detonation of an explosive device whether on or near a target has an instantaneous effect, which can be compounded and/or prolonged by the use of multiple devices.

The extent of damage caused by an explosion is, of course, determined by the type and quantity of explosive used. It should be noted that explosive incidents can result in cascading effects, such as the incremental failure of a structure or system.

Arson and other incendiary attacks refer to the initiation of fire (which can be of an explosive nature) on or near a target. This type of event can last for minutes or hours, and possibly longer depending on the type and quantity of device or accelerant used and the materials (fuels) present at the location of the attack. This type of attack can also result in cascading failures of structures or systems.

Radiological terrorism is the malicious use of a radiological device; and attacks on nuclear facilities, such as nuclear power plants are the two types of radiological terrorism. Both types have certain features in common, such as attempting to cause radioactive contamination and playing off public fear of radiation. The consequences of both types of attack could also have similarities, such as slightly elevated health risks or massive economic costs.

An **electromagnetic pulse** is a short burst of electromagnetic energy that may be the result of lighting, switching, solar magnetic disturbance, non-nuclear electromagnetic weapons or nuclear weapons. The effects may cause the failure of electricity and communications and require recovery prolonged efforts. Preparations are similar to other losses of power and communication and may include training, research and trial and error to implement proper measures to manage emergencies and protect equipment. Recovery may take months or more if a large area of the country is affected.

Utilities and the Electric Power Research Institute may consult and participate in drills to train state, local government and private organizations to minimize the effects to Delaware. A high-altitude detonation of a large nuclear weapon can generate a large electromagnetic pulse that can affect a more than half the country. Damage can result to power distribution and electronic infrastructure.

Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom is **conventional terrorism.** Hazard effects are instantaneous; additional secondary devices may be used, lengthening the time duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences, incremental structural failures, etc. Conventional terrorism can also include tactical assault or sniping from remote locations.

Delaware has not been immune to acts of terrorism or sabotage. For example, the state has experienced many bomb threats, in the distant and recent past, especially in schools and abortion clinics. Unfortunately, there will never be a way to totally eliminate all types of these clandestine activities. If person or persons are inclined to cause death and destruction, they are usually capable of finding a way to carry out their plans. As perpetrators of terrorism improve their ability to collect information, raise money, and issue rhetoric, implementation of effective counter measures becomes even more important.

Use of biological agents against persons or property for purposes of intimidation, coercion or ransom can be described as **biological terrorism**. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents may pose viable threats from hours to years depending upon the agent and the conditions in which it exists. Depending on the agent used and the effectiveness with which it is deployed, contamination can be spread via wind and water. Infections can be spread via human or animal vectors.

Delaware has not been immune to acts of terrorism or sabotage. The state has experienced many threats in the past. Most incidents have been limited to reported “suspect” powders, actual threats, and hoaxes. Beginning in October 2001, following the original “Anthrax” scares, Delaware experienced a large number of responses for suspicious powders. Following the development of a threat assessment / response protocol the number of responses was reduced; and now averages a few responses each month.

Causing intentional harm to an agricultural product or vandalism of an agricultural/animal related facility is **agroterrorism**. Activities could include the following examples: animal rights activists who release mink or lab animals; disgruntled employees who intentionally contaminate bulk milk tanks or poison animals; ecoterrorists who destroy crops/facilities; theft of agricultural products, machinery, or chemicals; or criminals who vandalize agricultural facilities. Delaware is home to several research laboratories that use animals in the course of their product development.

This category covers a large variety of incidents from potential to intentional introduction of disease; vandalism of facilities; theft of agricultural products, machinery, or chemicals; release of animals; and contamination of agricultural products. Depending upon the type of action taken, the implications will vary greatly.

Chemical terrorism involves the use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Liquid/aerosol or dry contaminants can be dispersed using sprayers or other aerosol generators; liquids vaporizing from puddles/containers; or munitions. Chemical agents may pose viable threats for hours to weeks depending on the agent and the conditions in which it exists. Contamination can be carried out of the initial target area by persons, vehicles, water and wind. Chemicals may be corrosive or otherwise damaging over time if not mitigated.

Cyber terrorism is an electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber-attack. Cyber terrorism may last from minutes to days depending upon the type of intrusion, disruption, or infection. Generally, there are no direct effects on the built environment, but secondary effects may be felt depending upon the system being terrorized. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks.

Disruption of service refers to the interruption, failure or denial of a service due to terrorist attack, such as the sabotage or designed breakdown of infrastructure as with an attack on transportation facilities, utilities and other public services. While the Federal Bureau of Investigation found no evidence of terrorism or criminal activity in its investigation of the August 2003 blackout in the Northeast United States, and the paralyzing blackout in London, England the same month has been labeled a “freak event,” it is clear to see the potential damage and disruption that could be caused by an intentional terrorist attack on a nation’s power grids.

The term “**Weapons of Mass Destruction**” (WMD) has various definitions, however common to all is the assumption that WMDs may consist of any of the agents discussed above: chemical, biological, radiological, nuclear, explosive or incendiary. The purpose of a WMD is to cause death or serious injury to persons or significant damage to property, typically assumed to be of a scale which has the potential to overwhelm the capabilities of many local and state governments.

4.3.3 Hazardous Materials (HazMat)

Hazardous materials (HazMat) incidents include:

- fixed HazMAT incident
- fixed radiological incident
- transportation HazMAT incident

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 70: HazMAT EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.

Subject	Ranking	Impacts
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

Hazardous materials (HazMat) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the Nation's highways and on the water. According to the United States Department of Transportation HazMat Incident Portal, there were 13,168 highway HazMat incidents in 2012, resulting in 11 fatalities and over $57 million in property damage. Hazmat incidents consist of solid, liquid and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HazMat incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind and possibly wildlife as well.

HazMat incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes, and earthquakes, which in addition to causing incidents can also hinder response efforts.

In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills and a variety of other environmental pollutants that caused widespread toxicological concern.

A **fixed hazardous materials incident** is the accidental release of chemical substances or mixtures, which presents a danger to the public health or safety, during production or handling at a fixed facility. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever-increasing types and quantities. Each year, over 1,000 new synthetic chemicals are introduced, as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals."

An incident resulting in a release of radiological material at a fixed facility to include power plants, hospitals, laboratories and the like is a **fixed radiological incident**. Although the term "nuclear accident" has no strict technical definition, it generally refers to events involving the release of significant levels of radiation

Delaware has no nuclear power plants located within its borders, but the Salem-Hope's Creek Nuclear Plant, operated by PSEG, is across the Delaware River in New Jersey, and many areas of the state are well within the 10-mile Emergency Planning Zone. Since 1990, the Salem-Hope's Creek Nuclear Power Plant has had a small number of Unusual Events, two Alerts, and no Site Area Emergencies or General Emergencies.

Accidental release of a chemical substance or mixture that presents a danger to public health or safety during transportation is a **transportation hazardous materials incident**. A hazardous substance is one that may cause damage to person(s), property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever increasing types and quantities, as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive and each year over 1,000 new synthetic chemicals are introduced and transported across the county via semi-truck and train. Hazardous materials incidents generally affect a localized area, and the use of planning and zoning can minimize the area of impact.

In 2006, forty-eight significant incidents involving the transportation of hazardous materials occurred in Delaware. Large quantities of hazardous materials are transported daily on Delaware streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials, as are railways. The Delaware Department of Transportation (DelDOT) regulates the routes and speed limits used by carriers and monitors the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic uses and are being transported on Delaware roads and railways.

Radiological incidents related to transportation are described as an incident resulting in a release of radioactive material during transportation. Transportation of radioactive materials through Delaware over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. When these materials are moved across Delaware highways, state officials are notified, and appropriate escorts are provided.

Transportation accidents are the most common type of incident involving radioactive materials because of the sheer number of radioactive shipments. Rail and highway routes for the shipment of radioactive waste have been identified and mapped (I-95 is the only approved route for radiological waste in the state). Operators of facilities that use radioactive materials and transporters of radioactive waste are circumspect in the packaging, handling, and shipment of the radioactive waste and, since they are closely regulated by a variety of federal, state, and local organizations, the likelihood of an incident is remote.

Most hazardous materials incidents in Delaware are reported through the local 911 centers. When it is apparent hazardous materials are involved, both the local fire department and DNREC respond to the situation. DNREC responders, through coordination with the fire chief, work to remediate the situation. DNREC tracks these responses; the analysis of those responses is shown later in this section. Based on the size, scope and complexity of the response, the State Emergency Response Team (SERT), which can assist in coordinating information and material, may also be activated to deal with the situation.

4.3.4 Transportation/Infrastructure Incidents

Transportation/Infrastructure incidents include:

- air transportation incident
- highway transportation incident
- railway transportation incident
- water transportation incident
- pipeline transportation incident
- energy pipeline failures
- communication failures
- dam failure

- structural failure
- structural fire

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 71: Transportation Incidents EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

An **air transportation incident** may involve a military, commercial, or private aircraft. Air transportation is playing a more prominent role in transportation as a whole; airplanes, helicopters, and other modes of air transportation are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident; mechanical failure, pilot error, enemy attack, terrorism, weather conditions, and on-board fire can all lead to an incident at or near the airport. Air transportation incidents can occur in remote unpopulated areas, residential areas, or downtown business districts. Incidents involving military, commercial, or private aircraft can also occur while the aircraft is on the ground. Delaware has one commercial airport, one large military airport, 30 privately-owned/public use airports, and 15 heliports. Additionally, northern Delaware is in the approach and departure paths for Philadelphia International Airport.

Despite the increase in the number of people using air travel, incidents that require response personnel and involve casualties are likely to continue to decrease in number due to increases in the quality of training, equipment, and safety. Proper land-use near airports will also decrease the chance that people and property on the ground will suffer significant impacts in the event of an air transportation accident.

A **highway transportation incident** can be single or multi-vehicle requiring responses exceeding normal day-to-day capabilities. An extensive surface transportation network exists in Delaware; local residents, travelers, business, and industry rely on this network on a daily basis.

Thousands of trips a day are made on the streets, roads, highways, and interstates in the state; if the designed capacity of the roadway is exceeded, the potential for a major highway incident increase. Weather conditions play a major factor in the ability of traffic to flow safely in and through the state as does the time of day (rush hour) and day of week.

A **railway transportation incident** is a train accident that directly threatens life and/or property, or adversely impacts a community's capability to provide emergency services. Railway incidents may include derailments, collisions, and highway/rail crossing accidents. Train incidents can result from a variety of causes, including human error, mechanical failure, faulty signals, and/or problems with the track. Results of an incident can range from minor "track hops" to catastrophic hazardous material incidents and even human/animal casualties. With the many miles of track in Delaware, vehicles must cross the railroad tracks at numerous at- grade crossings.

A **water transportation incident** is an accident involving any water vessel that threatens life and/or adversely affects a community's capability to provide emergency services. Waterway incidents will primarily involve pleasure craft on rivers and lakes. In the event of an incident involving a water vessel, the greatest threat would be drowning, fuel spillage, and/or property damage.

A **pipeline transportation incident** occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near to the pipelines.

The energy infrastructure of the United States is comprised of many components, including the physical network of pipes for oil and natural gas, electricity transmission lines, and other means for transporting energy to the Nation's consumers. This infrastructure also includes facilities that convert raw natural resources into energy products, as well as the rail network, trucking lines and marine transportation. (U.S. Department of Energy, 2003) Much of this infrastructure is aging, and in addition to the challenges of keeping the infrastructure up-to-date with the latest technological advances and consumer needs, the potential for an **energy pipeline failure** to become a hazard in-and-of-itself must be considered.

The State of Delaware Energy Emergency Response Plan (DEERP) was published in December 2003. This plan is being revised and when completed will be included in the Delaware Emergency Operation Plan, Hazard Specific Annex HS-32. The DEERP presents information and regulations that may be enacted by the State if an energy emergency occurs. Succinctly put, the overall purpose of the plan is to provide for timely and coordinated notification to state government, private sector entities, institutions, the media and residents within the state of the occurrence of an energy emergency, and define appropriate actions to be taken— including enactment of regulations, rules, laws and other actions by the state. Aside from this action plan, a detailed history of hazards is not currently available for energy pipeline failures in of Delaware.

Energy pipelines cross most of the State of Delaware. If any of these energy pipelines, oil or gas, were to rupture, such an event could endanger property and lives in the immediate area (within less than half a mile radius).

Communication failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, long-term interruption of electronic broadcast services, emergency 911, law enforcement, fire, emergency medical services, public works, and emergency warning systems are just a few of the vital services which rely on communication systems to effectively protect citizens. Business and industry rely heavily on various communication media as well. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term. If switching stations are affected, the outage could be more widespread.

A **dam failure** is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. According to the Association of State Dam Safety Officials, dam failures are most likely to happen for one of five reasons:

- **Overtopping** caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam failures.
- **Foundation Defects**, including settlement and slope instability, cause about 30% of all dam failures.
- **Cracking** caused by movements like the natural settling of a dam.
- **Inadequate maintenance and upkeep.**
- **Piping** is when seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes in the dam. Another 20% of U.S. dam failures have been caused by piping (internal erosion caused by seepage). Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.

The collapse of part or all of any public or private structure including roads, bridges, towers, and buildings is considered a **structural failure**. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may cause the roof of a building to collapse. Heavy rains and flooding can undercut and washout a road or bridge. The age of the structure is sometimes independent of the cause of the failure.

A **structural fire** is an uncontrolled fire in populated areas that threatens life and property and is beyond normal day-to-day response capability. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved firefighting equipment, training, and techniques lessen the chance and impact of a major urban fire. Most structural fires occur in residential structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because of the volume or type of the material involved.

4.3.5 Other Incidents

Other Incidents include:

- enemy attack
- mass migration (i.e. evacuations)
- public disorder & civil disturbance
- school emergencies
- supply chain disruption

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 72: Other Incidents EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.

Subject	Ranking	Impacts
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Minimal to Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

Enemy attack is an incident that would cause massive destruction and extensive casualties. An all-out war would affect the entire population. Some areas would experience direct weapons effects: blast, heat, and nuclear radiation; others would experience indirect weapons effects, primarily radioactive fallout.

Mass repatriation is the procedure whereby U.S. citizens are officially processed back into the United States after evacuation from overseas. World events (war, government instability, disease, etc.) could be the catalyst for large scale repatriation.

Mass migration is the influx of a large number of people into the state via any means, as the result of any precipitating action. During the aftermath of Hurricane Katrina, for example, FEMA arranged for plane loads of evacuees to go to a variety of unaffected states.

Mass demonstrations, or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes are examples of **public disorder**. These involve the assembling of people together in a manner to substantially interfere with public peace and to constitute a threat. They may use unlawful force or violence against another person, cause property damage or attempt to interfere with, disrupt, or destroy the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target group or institution. Most events are within the capacity of local law enforcement.

School emergencies include hostage situations, incidents involving mass casualties, or incidents involving significant damage or destruction of campus facilities while school is in session and are magnified significantly due to the youth of the persons involved.

Supply chain disruption is an interruption in the flow of process that involves any of the entities associated with the production, sales, and disruption of specific goods or services. A systematized supply chain is crucial in maintaining the quality of products from start to end and ensure that all resources utilized are of the best quality.

4.3.6 Evolving Threats

Evolving threats include:

- space weather
- cyber threats

- disruption of service (cyber, physical)
- autonomous robotics
- electric vehicle hazards

The information provided in the following Consequence Analysis table is for accreditation with the Emergency Management Accreditation Program (EMAP).

Table 73: Evolving Threats EMAP Consequence Analysis

Subject	Ranking	Impacts
Health and Safety of Persons in the Area of the Incident	Minimal to Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Severe	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utilities most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Minimal to Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the storms and any damages sustained such as utilities and roads.
Public Confidence in Jurisdiction's Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

According to NASA**, space weather** can produce solar storm electromagnetic fields that induce extreme currents in wires, disrupting power lines, causing wide-spread blackouts and affecting communication cables that support the Internet. Severe space weather also produces solar energetic particles and the dislocation of the Earth's radiation belts, which can damage satellites used for commercial communications, global positioning and weather forecasting. Space weather has been recognized as causing problems with new technology since the invention of the telegraph in the 19th century. Besides emitting a continuous stream of plasma called the solar wind, the sun periodically releases billions of tons of matter called coronal mass ejections. These immense clouds of material, when directed toward Earth, can cause large magnetic storms in the magnetosphere and upper atmosphere. Such space weather can affect the performance and reliability of space-borne and ground-based technological systems.[6]

[6] NASA - NASA-Funded Study Reveals Hazards of Severe Space Weather

A **cyber or cybersecurity threat** is a malicious act that seeks to damage data, steal data, or disrupt digital life in general. Cyber threats include computer viruses, data breaches, Denial of Service (DoS) attacks, and other attack vectors.

Cyber threats also refer to the possibility of a successful cyber-attack that aims to gain unauthorized access, damage, disrupt, or steal an information technology asset, computer network, intellectual property, or any other form of sensitive data. Cyber threats can come from within an organization by trusted users or from remote locations by unknown parties.

According to roboticbiz.com, the potential hazards posed by **autonomous robots** can be broken down by source/cause, as follows: human interaction, control error, unauthorized access, mechanical failure, environmental source, power system fault, and improper installation.

- *Human interaction*: This includes hazards, dangerous, unpredicted movement or action due to human interaction associated with programming, incorrect activation of the teach pendant, interfacing activated peripheral equipment, connecting live input-output sensors to a microprocessor, etc. One of the most significant hazards is over-familiarity with the robot's redundant motions so that the individual places herself/himself in a dangerous position while programming or performing maintenance.
- *Control errors*: This includes intrinsic faults within the control system, software errors, and electromagnetic interference. These errors can occur due to defects in the hydraulic, pneumatic, or electrical sub-controls in the robot system.
- *Unauthorized access*: Entry into the safeguarded area is potentially hazardous. This hazard is more pronounced when the person involved is not familiar with the safeguards in place or the current activation status.
- *Environmental sources*: Electromagnetic interference (transient signals) can exert an undesirable influence on the automatic operation, causing a potential for injury.
- *Power systems*: This occurs when pneumatic, hydraulic, or electrical power sources with malfunctioning control elements disrupt the electrical signals to the control or power-supply lines. The causes a fire risk due to the potential for electrical overloads and the use of flammable hydraulic oil. It can also result in electrical shock to personnel.
- *Improper installation*: If the design requirements and layout of equipment are inadequate, it can lead to inherent hazards.

As the nation pushes forward towards all-electric vehicles and fleets, numerous **electric vehicle hazards** should be considered, including:

- Hacking into the vehicles control system
- Additional stress on the power grid due to the addition of charging ports
- Combustion and re-combustion concerns, as typical firefighting procedures are not effective
- The possibility of complete power failure in the event of mass charging during an evacuation
- Electrocution of motorists and responders when water is present, such as charging during a flood

4.4 Risks & Vulnerabilities

Risk, for the purpose of hazard mitigation planning, is the potential for damage, loss or other potential impacts created by the interaction of natural hazards with community assets. Hazards are natural processes, such as tornados, floods and earthquakes. The exposure of people, property and other community assets to natural hazards can result in disasters, depending on the impacts. Potential impacts are the consequences or effects of the hazard on the community and its assets. The type and severity of potential impacts (described in each hazard profile) are based on the intensity of the hazard and the vulnerability of the community's assets, as well as the community's ability to mitigate, prepare for, respond to, and recover from events.

The figure below illustrates the concept of risk as the relationship, or overlap, between hazards and community assets. The smaller the overlap, the lower the risk.

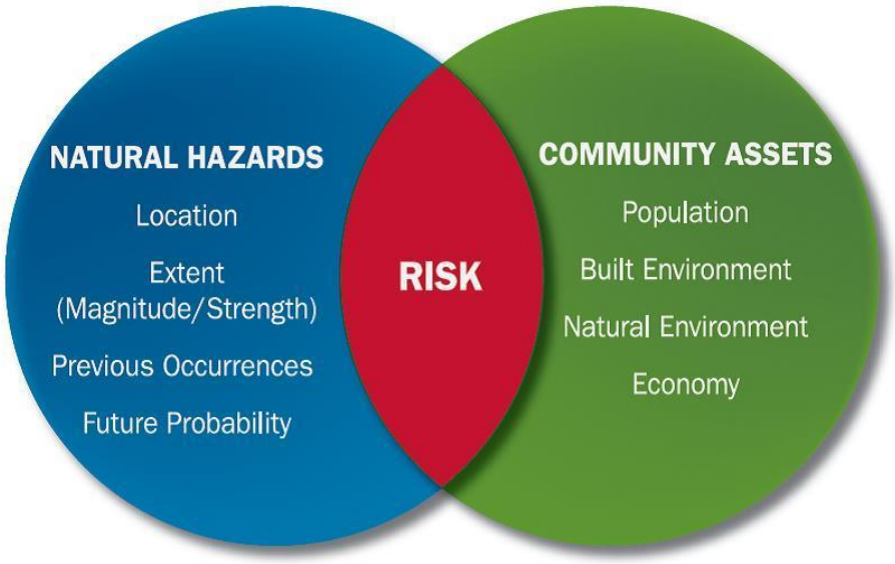


Figure 39: Community Risk from Natural Hazards

The State Hazard Mitigation Council conducted a risk assessment to determine vulnerabilities within the State. The following information is an overview of vulnerabilities within the State, including data about people, economy, built environment, natural environment, and community lifelines.

4.4.1 State Assets

Based on historical, scenario, and exposure analysis; changes in development; topography; and impact of climate change, it is considered that all state assets have the potential to be directly or indirectly impacted by the identified hazards in Delaware. State assets that are at risk and vulnerable to the hazards include:

- People
- Economy
- Natural environment
- Built environment

The community assets identified in this section create the basis of the risk and vulnerability assessment to the hazards impacting the State of Delaware. The vulnerability assessment will help determine mitigation opportunities or corrective actions that can be designed or implemented to reduce the vulnerabilities and make the State more disaster resistant.

4.4.1.1 People

The U.S. Census Bureau is the leading source of statistical information about the nation's people. Their population statistics come from decennial censuses (which count the entire U.S. population every ten years), annual surveys such as the American Community Survey (ACS) and the Current Population Survey (CPS), and the periodic Survey of Income and Program Participation (SIPP). The U.S. Census Bureau data for the State of Delaware and its counties is reflected in following tables.

Table 74: 2021 Census Population

Population	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Population Estimates, July 1 2021, (V2021)	184,149	571,708	247,527	1,003,384

Table 75: 2021 Census Demographics

Demographics	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Female persons, percent	51.70%	51.30%	51.50%	51.40%
White alone, percent	64.30%	63.40%	83.20%	68.40%
Black or African American alone, percent	28.40%	27.20%	11.80%	23.60%
American Indian and Alaska Native alone, percent	0.80%	0.50%	1.10%	0.70%
Asian alone, percent	2.40%	6.00%	1.40%	4.20%
Native Hawaiian and Other Pacific Islander alone, percent	0.10%	0.10%	0.20%	0.10%
Two or More Races, percent	4.10%	2.80%	2.30%	2.90%
Hispanic or Latino, percent	7.80%	11.00%	9.60%	10.10%
White alone, not Hispanic or Latino, percent	58.80%	54.80%	75.40%	60.60%

Table 76: 2021 Housing & Education Census

Housing & Education	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Housing units, July 1, 2021, (V2021)	75,086	235,323	147,545	457,954
Owner-occupied housing unit rate, 2016-2020	68.80%	67.90%	81.10%	71.40%
Median value of owner-occupied housing units, 2016-2020	$226,600	$266,500	$269,700	$258,300
Building permits, 2021	1,873	1,822	4,805	8,500
Households, 2016-2020	67,299	209,431	94,223	370,953
Households with a computer, percent, 2016-2020	91.30%	94.50%	91.10%	93.10%
Households with a broadband Internet subscription, percent, 2016-2020	87.00%	89.10%	83.90%	87.40%

Housing & Education	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
High school graduate or higher, percent of persons age 25 years+, 2016-2020	88.00%	92.10%	89.00%	90.60%
Bachelor's degree or higher, percent of persons age 25 years+, 2016-2020	24.50%	36.70%	29.40%	32.70%
Median household income (in 2020 dollars), 2016-2020	$60,117	$75,275	$64,905	$69,110

Other populations that should noticed when planning include non-English speakers, mobile home residents, the transportation-disadvantaged, and those with functional needs. Functional needs populations, in the context of emergencies, include individuals who may be more vulnerable because of immobility or their inability to take protective action. These individuals include individuals with disabilities, pregnant women, children, elderly persons, prisoners, certain members of ethnic minorities, people with language barriers, and the impoverished.

For these populations, emergency response failures can have catastrophic consequences, including loss of the ability to work or live independently, permanent injury, and death. Without appropriate preparation, vulnerable individuals may not be able to evacuate as instructed, reach points of distribution for medical countermeasures, understand written or verbal communications during an emergency, or find suitable housing if their residences are destroyed during a disaster.

These individuals may have additional needs before, during, and after an incident in functional areas, including maintaining independence, communication, transportation, supervision, and medical care.

Knowing where these populations are located in the community is important so that additional measures can be taken as deemed necessary prior to and immediately following a hazard. The following table provides demographic information from the U.S. Census Bureau as of 10/11/2022.

Table 77: 2021 Census of Vulnerable Populations

Vulnerable Populations	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Persons in poverty, percent	13.00%	10.10%	11.00%	10.90%
Persons without health insurance, under age 65 years, percent	9.00%	6.80%	10.40%	8.10%
With a disability, under age 65 years, percent, 2016-2020	12.10%	8.40%	9.00%	9.30%
Language other than English spoken at home, percent of persons age 5 years+, 2016-2020	11.20%	15.20%	10.90%	13.40%
Veterans, 2016-2020	17,242	30,066	17,757	65,065
Foreign born persons, percent, 2016-2020	6.20%	11.50%	7.00%	9.40%
Persons under 5 years, percent	5.90%	5.40%	4.80%	5.30%
Persons under 18 years, percent	22.90%	21.30%	18.00%	20.80%
Persons 65 years and over, percent	17.90%	16.60%	29.80%	20.10%

Vulnerable populations are more likely to experience adverse social, health, and economic outcomes due to their race, age, gender, poverty status, and other socioeconomic measures.

New technologies that provide 9-1-1 and public safety officials with the ability to proactively engage the community have had a dramatic effect on mortality rates during the increasing scope of natural disasters. Identifying at risk populations and providing them with information and assistance when they most need it can make a significant difference, especially in the event of an evacuation or seeking shelter. One measure of the strength of a community's response and recovery system is its attentiveness to its most vulnerable residents.

The 2020 Delaware Strategies for State Policies and Spending provides clues on the shape and location of development to accommodate Delaware's changing population is supported in the following:

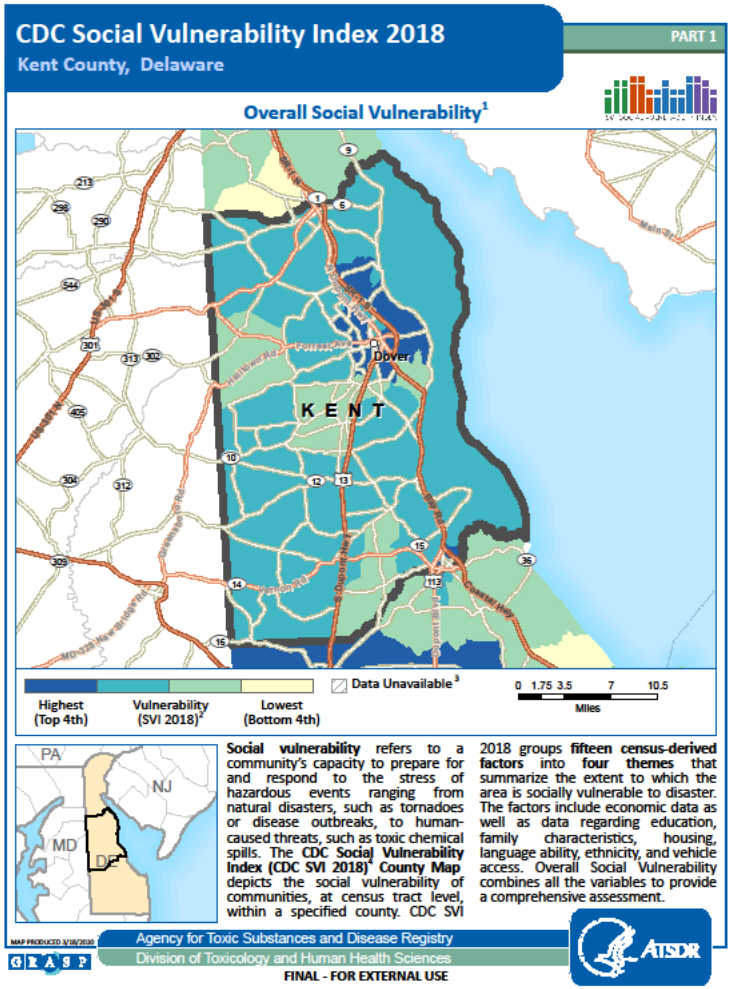
- National research indicates that demographic changes and consumer preferences will dramatically shift the demand for the style and type of housing in the next 10 years.
- "As baby boomers become empty nesters and retirees, they are drawn to compact, walkable neighborhoods. So are single adults and married couples without children."
- The aging population tends to favor "downsizing" and moving near community amenities.
- Younger Americans do not share their parents' preference for large-lot, single-family lifestyles. They tend to prefer a community setting and more compact units.
- Arthur C. Nelson, of the University of Arizona, projects that by 2025, the demand for attached and small-lot housing will exceed the current supply by 35 million units (71%), while the demand for large-lot housing will actually fall short of the current supply. "Committee have too much of the big stuff already."
- From 2020 to 2040, the percentage of Delawareans over the age of 65 is expected to increase by 40%, while the percentage over 85 is expected to double.
- Delaware's population of non–U.S. born residents grew by about 40% between 2000 and 2010. In Sussex County, this population nearly doubled through the same time period.
- With people come vehicles. Both the total number of vehicles and the miles being driven are increasing faster than the population is growing. DelDOT reports that Average Annual Vehicle Miles Traveled (VMT) increased by 141% between 1980 and 2018, while Delaware's population, according to the U.S. Census Bureau, increased approximately 62% during the same time period. Understanding VMT trends helps the state achieve greenhouse gas goals—which are important for improving public health and quality of life and addressing climate change.
- Climate change will significantly alter Delaware's landscape and quality of life. DNREC reports show that sea level rise could inundate up to 17,000 homes and 500 miles of roadway by the end of the century. Many of the most at-risk areas are those that have high development pressure, like Coastal Sussex County. The changes arising from climate change will continue to impact roadways, water and wastewater infrastructure, and public health.
- The trend in Delaware has been toward growth in unincorporated areas outside towns. As of 2020, more than 71 percent of Delawareans live outside town and city limits. This trend is expected to reverse itself as more growth is directed into municipalities. The Delaware Population Consortium estimates that in 2020 the percentage of population in municipalities has increased to 29%, and it is expected to increase to 31% in 2040.

The following graphs were developed by the National Risk Index and reflect the social vulnerability within the three (3) Delaware counties. Social Vulnerability is measured using the Social Vulnerability Index (SoVI) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).

The methodology used by the National Risk Index has been reviewed by subject matter experts in the fields of natural hazard risk research, risk analysis, mitigation planning, and emergency management. The processing methods used to create the National Risk Index have produced results similar to those from other natural hazard risk analyses conducted on a smaller scale. The breadth and combination of geographic information systems (GIS) and data processing techniques leveraged by the National Risk Index enable it to incorporate multiple hazard types and risk factors, manage its nationwide scope, and capture what might have been missed using other methods.

The National Risk Index does not consider the intricate economic and physical interdependencies that exist across geographic regions. Keep in mind that hazard impacts in surrounding counties or Census tracts can cause indirect losses in your community regardless of your community's risk profile.

All populations in Delaware have the potential to be directly or indirectly impacted by the identified hazards in the State.



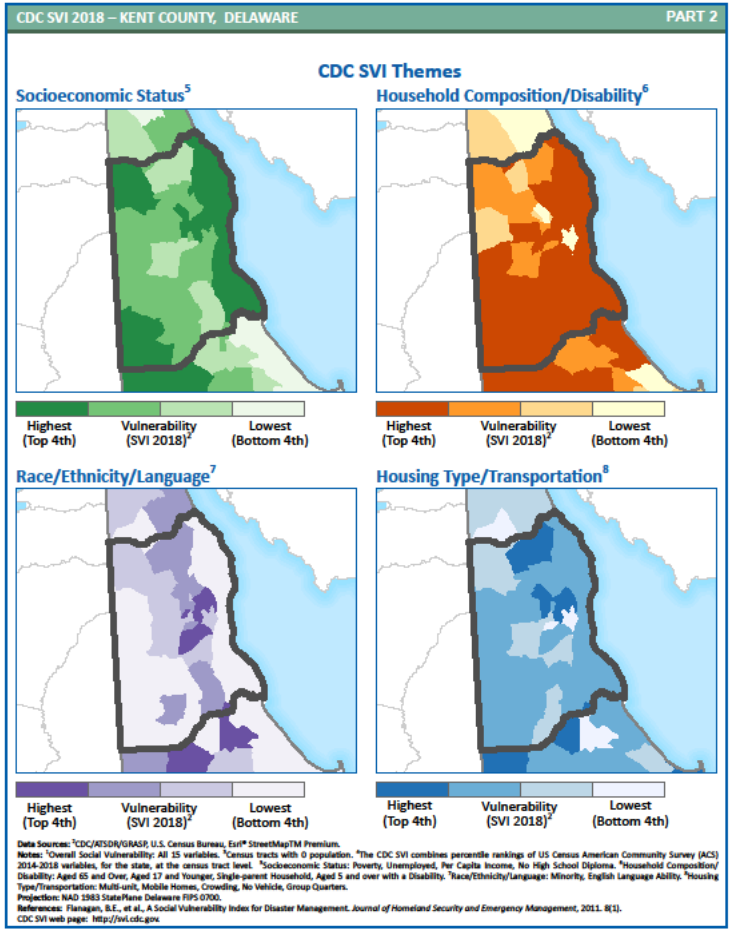
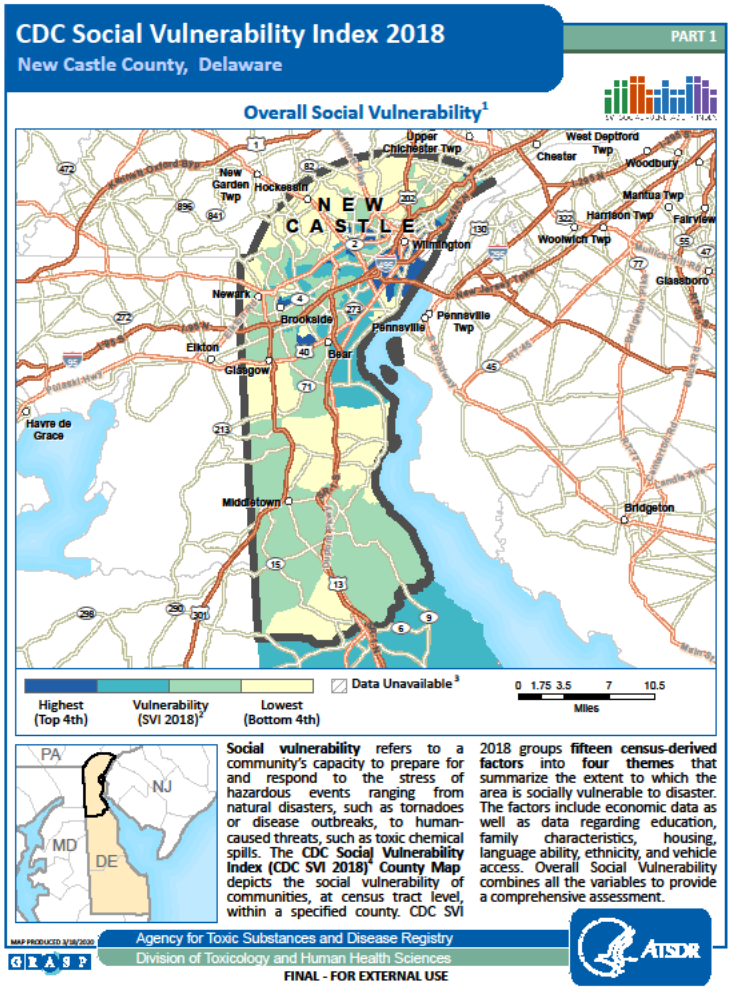


Figure 40: Kent County 2018 SVI



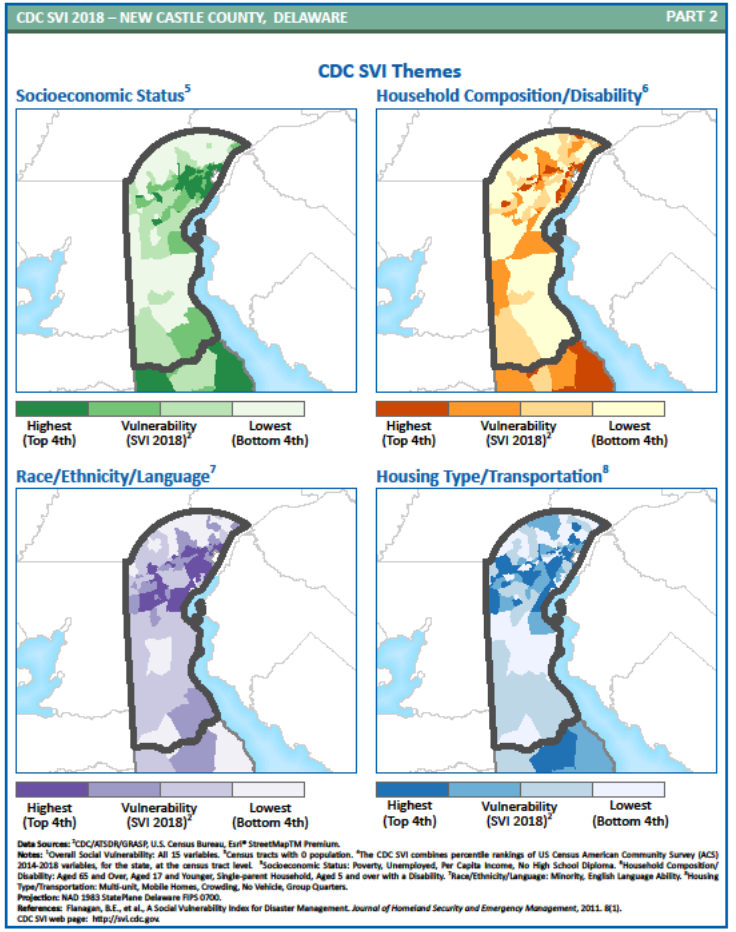
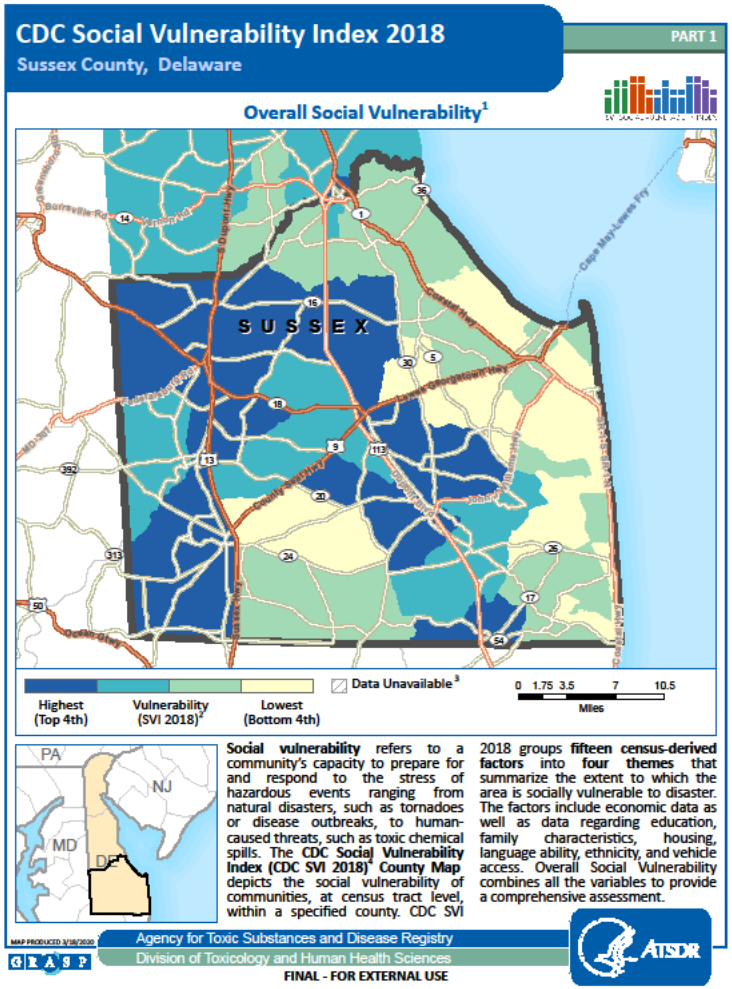


Figure 41: New Castle County 2018 SVI



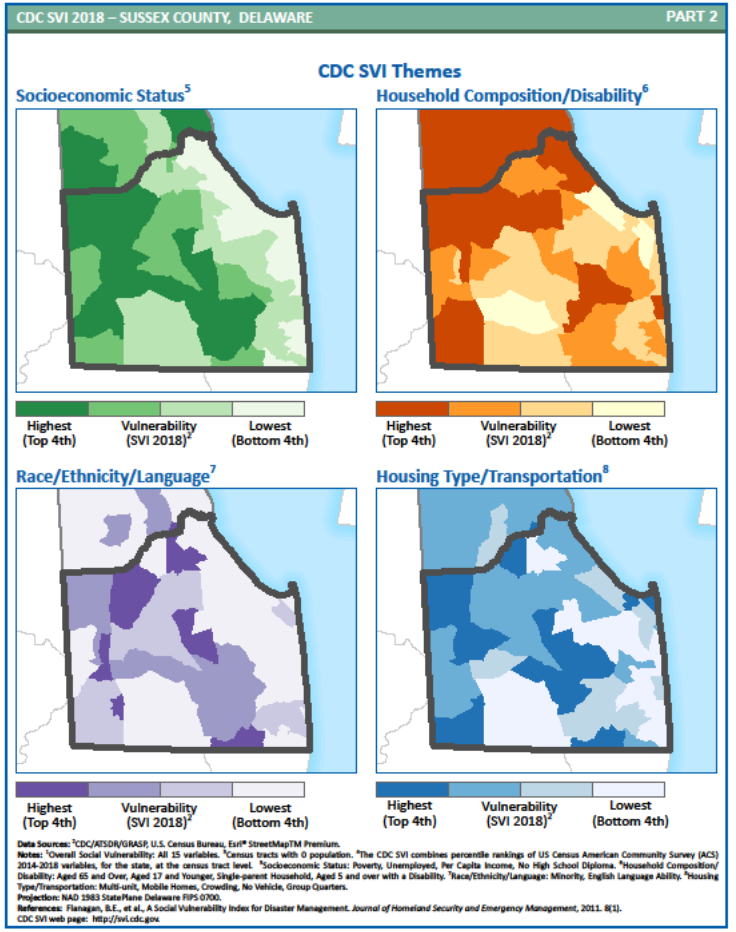


Figure 42: Sussex County 2018 SVI

4.4.1.2 Economy

Figure 43: Major Employers in Delaware

With a diverse range of fast-growing industries, Delaware is synonymous with influential corporate leaders, from JP Morgan Chase to DuPont and Perdue Farms to Highmark Blue Cross Blue Shield.

But Delaware is also home to successful small businesses, beloved homegrown brands, and quickly expanding startups which each benefit from Delaware's favorable business climate, internationally-oriented workforce, and seamless East Coast location.

Planning and growth management have enhanced Delaware's economic performance over the past twenty years. Key industries include:

- Science & Technology
- Business & Financial Services
- Food & Agriculture
- Manufacturing & Logistics
- Education & Healthcare

As of 2019, Delaware's per capita GDP (gross domestic product; the total market value of goods and services produced) is ninth among all states.

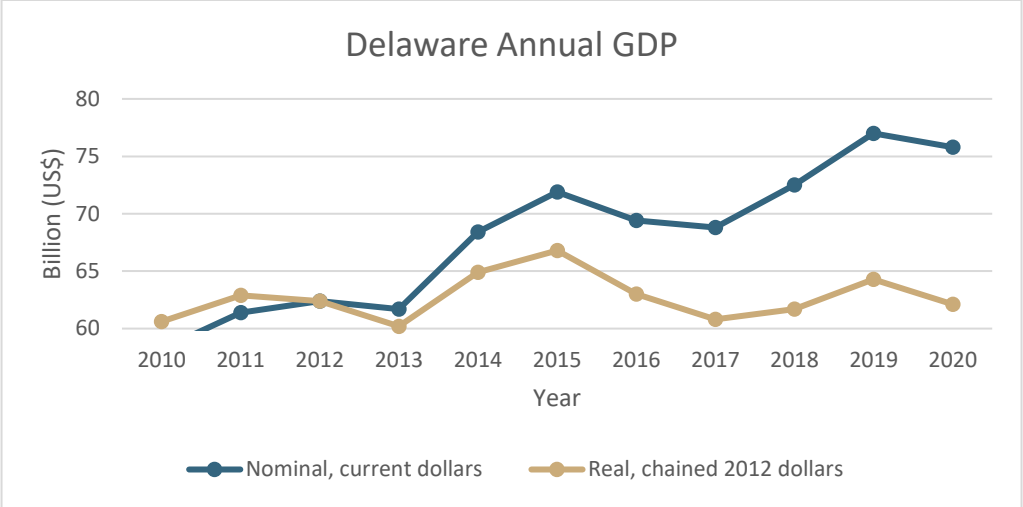


Figure 44: Delaware Annual GDP

According to the 2019 Value of Tourism Report, Tourism's contribution to the state's 2019 GDP was $3.5 billion.

- In 2018, there were 9.2 million visitors to the State of Delaware.
- The Delaware tourism industry is the 4th largest private employer in the state, accounting for 44,030 jobs.
- The tourism industry generated $545.1 million in tax revenue.
- Without tourism, each Delaware household would pay an additional $1,562 in taxes.

Delaware's economy has become impressively diverse, as shown in the following figure.

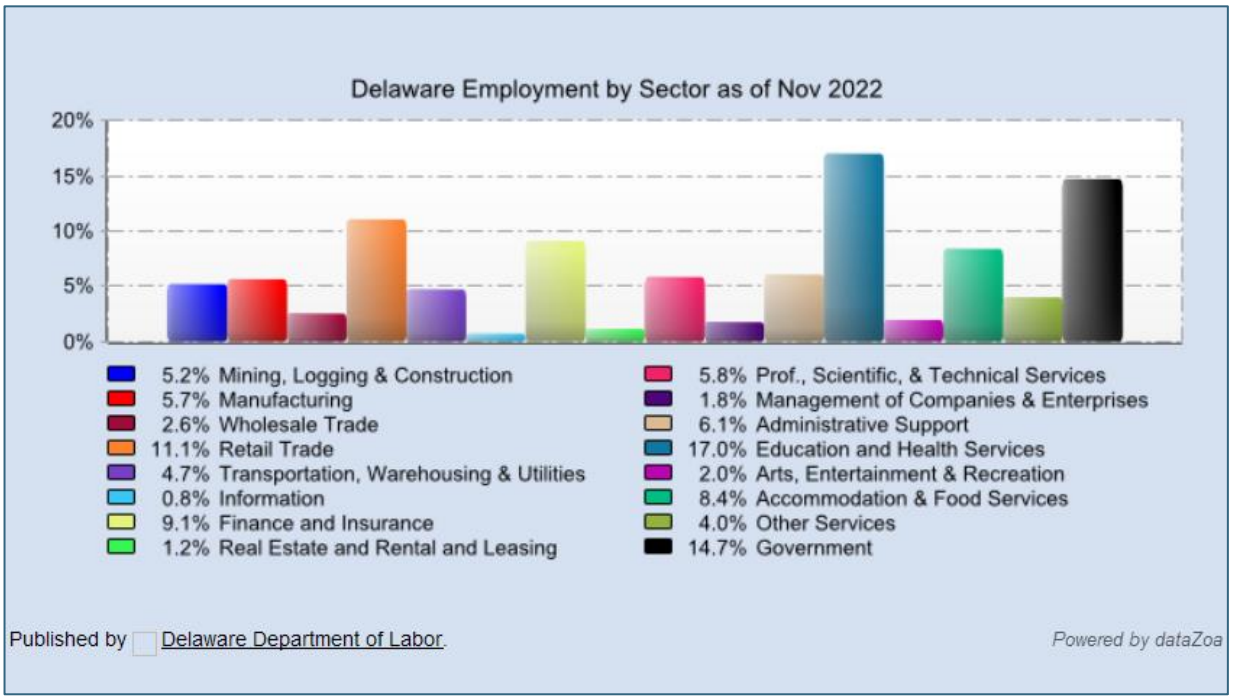


Figure 45: Delaware Employment by Sector

Diverse economic bases are resilient, and a downturn in any one sector is less likely to affect the overall economy. A 2018 analysis of economic diversity in the U.S. found that Delaware counties were more diverse than 73 to 95% of all counties. Economic productivity is also impressive in our agricultural sector. The market value of agricultural products sold by Delaware farmers increased from $767 million in 1997 to nearly $ 1.47 billion in 2017—a 91% increase in market value. This rate of increase outpaces all neighboring states

The following table provides additional economic information from the U.S. Census Bureau as of 10/11/2022.

Table 78: 2021 Economic Census

Economy	Kent County	New Castle County	Sussex County	Delaware
In civilian labor force, total, percent of population age 16 years+, 2016-2020	59.60%	65.00%	55.20%	61.60%
In civilian labor force, female, percent of population age 16 years+, 2016-2020	56.40%	61.70%	50.70%	58.10%
Total accommodation and food services sales, 2017 ($1,000)	476,295	1,360,556	717,543	2,554,394
Total health care and social assistance receipts/revenue, 2017 ($1,000)	1,248,869	6,099,322	1,507,139	8,855,330
Total transportation and warehousing receipts/revenue, 2017 ($1,000)	115,710	976,732	189,209	1,281,651
Total retail sales, 2017 ($1,000)	3,059,685	10,672,353	3,935,867	17,667,905
Total retail sales per capita, 2017	$17,310	$19,178	$17,516	$18,444
Mean travel time to work (minutes), workers age 16 years+, 2016-2020	26.3	26	26.8	26.2
Median household income (in 2020 dollars), 2016-2020	$60,117	$75,275	$64,905	$69,110
Per capita income in past 12 months (in 2020 dollars), 2016-2020	$28,911	$38,965	$36,739	$36,574
Persons in poverty, percent	13.00%	10.10%	11.00%	10.90%
Total employer establishments, 2020	4,163	16,874	6,074	27,472
Total employment, 2020	56,012	282,911	74,840	422,044
Total annual payroll, 2020 ($1,000)	2,495,701	19,114,169	3,079,016	25,114,966
Total employment, percent change, 2019-2020	3.20%	2.80%	0.70%	2.10%
Total non-employer establishments, 2019	12,047	42,665	19,206	73,918
All employer firms, Reference year 2017	3,150	12,788	4,502	19,704
Men-owned employer firms, Reference year 2017	1,805	7,238	2,761	11,571
Women-owned employer firms, Reference year 2017	473	2,053	631	3,144
Minority-owned employer firms, Reference year 2017	455	1,888	398	2,732
Nonminority-owned employer firms, Reference year 2017	2,167	8,606	3,629	14,148
Veteran-owned employer firms, Reference year 2017	247	689	368	1,293

Economy	Kent County	New Castle County	Sussex County	Delaware
Nonveteran-owned employer firms, Reference year 2017	2,317	9,653	3,511	15,232

The entire economy has the potential to be directly or indirectly impacted by the identified hazards in Delaware.

4.4.1.3 Natural Environment

Environmental assets and natural resources are important to community identity and quality of life and support the economy through agriculture, tourism and recreation, and a variety of other ecosystem services, such as clean air and water. The Department of Natural Resources and Environmental Control (DNREC) envisions a Delaware that offers a healthy environment where people embrace a commitment to the protection, enhancement and enjoyment of the environment in their daily lives; where Delawareans' stewardship of natural resources ensures the sustainability of these resources for the appreciation and enjoyment of future generations; and where people recognize that a healthy environment and a strong economy support one another.

The natural environment also provides protective functions that reduce hazard potential impacts and increase resiliency. Valuable areas that can provide protective functions that reduce the magnitude of hazard events include rivers, lakes, wetlands, beaches, and dunes. For instance, wetlands and riparian areas help absorb flood waters, soils and landscaping contribute to stormwater management, and vegetation provides erosion control and reduces runoff.

Conservation of environmental assets may present opportunities to meet mitigation and other community objectives, such as protecting sensitive habitat, developing parks and trails, or contributing to the economy. As the climate changes, FEMA is adapting to meet new challenges. Focusing on preserving the environment is just one of the many ways the country is confronting the potential impacts of climate change.

WATERSHED

Delaware's water, both ground and surface, is one of its most important natural resources. It is essential for meeting the needs of all segments of our society and for maintaining economic growth and agriculture. As of 2020, the Delaware Geological Survey claims that all water used for public and domestic supply and more than 98% of water used for irrigation south of the Chesapeake and Delaware Canal is ground water. North of the canal, approximately 70% of public water supplies are obtained from four surface-water sources (creeks) and 30% from ground-water resources.[7]

A key mission of the Delaware Geological Survey (DGS) is to inform and educate resource managers about our water resources so those resources can be protected and sustained. The DGS Survey, by statute, manages and provides liaison for all state-federal projects related to the DGS-USGS Joint-Funded and Partnering Programs.

The Division of Watershed Stewardship manages and protects the state's soil, water and coastlines. It uses a comprehensive array of watershed-based programs to ensure proper stewardship of Delaware's natural resources.

The Division protects and maintains the state's shoreline and navigable waterways. It regulates changes to coastal and urban lands. It develops and implements innovative watershed assessment, monitoring and implementation activities. It promotes wise land use, water quality and water management practices. And it works closely with Delaware's Conservation Districts to manage stormwater and assist farmers.

[7] Hydrologic Information for Delaware | The Delaware Geological Survey (udel.edu)

Details about the watershed and the Division's programs can be found on their website, [Division of Watershed Stewardship - DNREC Alpha (delaware.gov)]

Rivers in Delaware include Brandywine Creek, Chesapeake and Delaware Canal, Christina River, Leipsic River, Mispillion River, Murderkill River, Nanticoke River, Smyma River and St. Jones River.

Lakes include Indian River Bay, Rehoboth Bay, Little Assawoman Bay and Red Mill Pond.

A "**wetland**" is an area of land that is wet during the growing season. A true wetland has three characteristics: wetland plants, wetland soils, and evidence of water at or near the surface.

Wetlands provide many important services to humans and the environment. They improve water quality. They provide habitat for fish, wildlife and rare plants. They protect us from flooding and storm damage. And they provide open space on the landscape.

According to DNREC, both tidal and non-tidal wetlands cover nearly 25% of Delaware.

Beaches and dunes provide protection from wave action during coastal storms.

Beaches are made up of different parts, including the berm – the flat part good for recreation, and the dune – the tall ridge of sand covered with grass and other vegetation. Sand dunes are our first line of defense against coastal storms and beach erosion — they form a natural barrier to the destructive forces of wind and waves.

Sand dunes absorb the impact of storm surge and high waves, preventing or delaying flooding of inland areas and damage to inland structures. They are also sand storage areas that supply sand to eroded beaches during storms and barriers to windblown sand and salt spray.

Figure 46: Delaware Water Sources

VULNERABLE SPECIES

The DNREC Division of Fish and Wildlife conserves and manages Delaware's fish and wildlife and their habitats, and provides fishing, hunting, wildlife viewing and boating access on approximately 68,000 acres of public land.

Critical habitat areas and other environmental features that are important to protect include vulnerable species. Each state in the U.S. has completed a Wildlife Action Plan or Comprehensive Wildlife

Conservation Strategy to improve the stability and recovery of species which are in decline, already listed as threatened or endangered, and/or are representative of the diversity and health of the state's wildlife. To date, these plans have become important guides for natural resource management programs, conservation funding, partnership building, project development, and problem-solving at local and regional levels.

To help prevent species from becoming endangered, Delaware currently has a Wildlife Action Plan in place for restoring and maintaining important habitats and dwindling populations of the state's wildlife species. The number of Delaware's wildlife and species of greatest conservation need (SGCN) are listed by taxonomic group in the following table.

Table 79: 2015 List of Delaware SGCN Total

Taxonomic Group	Total SGCN	Tier 1 SGCN	Tier 2 SGCN	Tier 3 SGCN	Data Needs SGCN	Extirpated SGCN
Mammals	23	10	3	6	3	1
Birds	184	49	69	62	3	1
Amphibians	18	5	7	6	0	0
Snakes & Lizards	14	3	9	1	1	0
Turtles	10	8	2	0	0	0
Fishes	105	30	31	42	2	0
Freshwater Mussels	11	6	4	0	0	1
Marine/Estuarine Invertebrates	7	1	3	3	0	0
Freshwater &Terrestrial Snails	26	4	20	2	0	0
TOTAL	688	198	245	149	89	7

Definitions:

TIER 1: **Tier 1 species are in the highest need of conservation action. These include the rarest species in the state, species that are highly globally imperiled, and species with regionally important Delaware populations that are also under high threat from climate change.**

TIER 2: **Tier 2 species are of moderate conservation concern in Delaware. These include species that have rare to uncommon breeding populations in the state, species with broad distributions that are threatened by climate change, and species for which Delaware has high responsibility within the Northeast region.**

TIER 3: **These species are for the most part still relatively common in Delaware, but are listed as SGCN for various reasons, including documented population declines, high responsibility of the Northeast region for the global population, or continued need for monitoring and/or management. This tier also includes non-breeding species that are uncommon in Delaware.**

Data Needs: **These are species in need of monitoring efforts to determine their conservation status in Delaware.**

Extirpated**: These species once occurred in Delaware but have been determined through extensive survey effort to no longer occur in the state. The extirpated species included as SGCN have some possibility of reintroduction (i.e., suitable habitat may occur in the state and potential source populations may exist).**

DNREC also addresses invasive species in the form of regulations, as Title 3 Chapter 29 states that, "No person may import, export, buy, sell, transport, distribute, or propagate any viable portion, including seeds, of a plant on the Invasive Plant List."

All components of the natural environment in the State have the potential to be directly or indirectly impacted by the identified hazards in Delaware.

4.4.1.4 Built Environment: Critical Facilities & Infrastructure

The **built environment** includes existing structures, infrastructure systems, and critical facilities. The estimated total dollar losses to the built environment from a hazard was determined using Hazus 6.0 software and are summarized in the **Appendix B Hazus Reports**.

Though the Hazus scenarios are only for a 100-year flood event, 500-year earthquake event, and 100-year hurricane event, it could be said that the estimated dollar losses to the built environment would be similar across all hazards, depending on the intensity of the hazard.

Delaware's entire built environment is similarly exposed to all hazards other than coastal floods and coastal erosion. For coastal hazards, structures along the shoreline and within the coastal SFHA zone are more exposed than inland structures.

Table 80: Built Environment Vulnerable to Coastal Hazards

Depth	Count	Structure Value	Content Value
1-foot inundation			
Commercial	75	$34,361,889.36	$3,431,889.36
Industrial	6	$8,585,395.37	$12,155,712.05
Public	1	$207,964.43	$207,964.43
Residential	222	$67,211,529.51	$33,605,764.77
Total	**304**	**$110,366,778.67**	**$49,401,330.61**
3-foot Inundation			
Commercial	416	$436,948,771.00	$437,767,462.00
Industrial	55	$65,558,814.00	$89,698,095.00
Public	24	$17,465,708.00	$17,465,708.00
Residential	5,072	$1,423,726,162.00	$711,863,080.00
Total	**5,567**	**$1,943,699,455.00**	**$1,256,794,345.00**
5-foot Inundation			
Commercial	998	$1,128,974,090.91	$1,116,376,159.85
Industrial	151	$177,312,075.35	$241,981,902.67
Public	72	$89,033,492.24	$94,004,050.15
Residential	12,546	$3,815,326,911.25	$1,907,663,453.89
Total	**13,767**	**$5,210,646,569.75**	**$3,360,025,566.56**
7-Foot Inundation			
Commercial	1,716	$2,337,852,686.27	$2,320,853,682.12
Industrial	244	$311,115,235.60	$428,246,478.05
Public	120	$161,121,634.51	$169,690,121.74
Residential	20,448	$6,564,846,346.27	$3,282,423,170.48
Total	**22,528**	**$9,374,935,902.65**	**$6,201,213,452.39**

Within the built environment, critical infrastructure and facilities are analyzed. Critical infrastructure includes the vast network of highways, connecting bridges and tunnels, railways, utilities and buildings necessary to maintain normalcy in daily life.

Transportation, commerce, clean water and electricity all rely on these vital systems. Historically, Delaware has been an industrial state with a variety of manufacturing industries across the northern part.

As the economy is evolving, Delaware has seen a reduction in these sites as some are being transformed into new opportunities, like the University of Delaware's Science Technology and Advanced Research (STAR) Campus at the former Chrysler site. Delaware's agricultural and tourism industry remain strong and are both a key driver of Delaware's economy.

The Port of Wilmington serves as a major shipping port on an active trade route, servicing numerous large U.S. cities as well as other foreign ports.

Delaware is also served by approximately 240 miles of railroads. Passenger rail service is provided by multiple agencies including Amtrak, the Southeastern Pennsylvania Transportation Authority (SEPTA) and the Wilmington & Western Railroad. Freight railway is provided by CSX Transportation and Norfolk Southern Railway. Amtrak's Northeast Corridor (NEC) is a vital connection for local community members and a critical link in the regional/national transportation system. The NEC carries low-speed freight (including hazardous materials of all types), and high-speed passenger rail traffic across the state. Incidents along the NEC pose risks to the surrounding community and can have broader implications for the entire Eastern Seaboard. The Norfolk Southern railroad also maintains a small yard facility within Newark, further exposing the community to hazardous materials risk from stationary railcar storage and freight switching activities.

There are several public airports located in Wilmington, Dover, and Georgetown. For commercial air travelers, the northern Delaware area is also served by a major international airport in Philadelphia and the central and southern Delaware area is also served by the international airport in Baltimore. In addition, Dover Air Force Base is one of the most important military air cargo terminals on the East Coast.

Two major natural gas pipelines transit the state of Delaware. While pipeline incidents are rare, the mere existence of this critical infrastructure increases the relative risk to the adjacent community.

As mentioned in the Dam Failure Flooding profile, out of the 83 dams in Delaware, 57 are considered high hazard and are required to have an Emergency Action Plan (EAP). A high hazard-potential rating does not imply that a dam has an increased risk for failure; it simply means that if failure were to occur, the resulting consequences would likely be a direct loss of human life and extensive property damage. Of the 57 high hazard dams, 37 are state regulated by DNREC. The dam type of all but one (Edgar M. Hoopes Dam) is earth. Over the last 20 years, the number of high hazard-potential dams has more than doubled as development steadily encroaches on once-rural dams and reservoirs. Please contact the dam owner or the Delaware Dam Safety Program for detailed information on specific dams**.**

Critical facilities and infrastructure provide services and functions essential to a community, especially during and after a disaster. For a critical facility to function, building systems and equipment must remain operational.

Furthermore, it must be supplied with essential utilities (typically power, water, waste disposal, and communications, but occasionally natural gas and steam). The following figure highlights key facts about Delaware's infrastructure as of 2021.

Figure 47: Key Facts About Delaware's Infrastructure[8]

When critical infrastructure fails, it becomes nearly impossible to aid those who lack the means of evacuating on their own. This results in rescue operations that take longer to plan and execute and pose increased risks to first responders and residents due to the lack of information on the number of affected residents or the location of those who need additional assistance.

This inventory of existing buildings (number, type, value) and estimation of potential loss following known hazards helps determine actions during damage assessment. Knowing areas of weakness helps focus resources, particularly on vulnerable populations and critical facilities, which could impact recovery.

[8] Delaware Infrastructure | ASCE's 2021 Infrastructure Report Card

Critical facilities and infrastructure also incorporate FEMA's Community Lifelines. FEMA launched the Community Lifelines Framework in 2019 to help communities better monitor disruptions to critical services and systems following a disaster and reduce cascading potential impacts to government and business functions.

Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. The integrated network of assets, services, and capabilities that provide community lifeline services is used day to day to support the community's recurring needs. Lifelines enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security, as described in the National Response Framework, 4th edition. Lifelines include:

1. **Safety and Security:** Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
2. **Food, Water, Shelter:** Food, Water, Shelter, Agriculture
3. **Health and Medical:** Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
4. **Energy:** Power Grid, Fuel
5. **Communications:** Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
6. **Transportation:** Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
7. **Hazardous Materials:** Facilities, HAZMAT, Pollutants, Contaminants

These lifelines can be potentially impacted by any other the hazards identified in this plan. Efforts to mitigate potential impacts on Community Lifelines are key to building resilience. These Community Lifelines connect to the sectors in the National Mitigation Framework and the Recovery Support Functions under the National Disaster Recovery Framework; the same agencies and departments who support these sectors also often support Community Lifelines and the recovery mission. It is important to include state partners and other individuals, possibly including non-state entities, representing these sectors and lifelines in the state mitigation planning process.

A database of 2022 critical facilities was developed using the Hazus 6.0 software that is reflected in the table and maps below.

Table 81: Critical Facilities in Delaware

Critical Facility	New Castle County	Kent County	Sussex County	Delaware
Medical Care Facilities	11	4	5	20
Emergency Operations Centers	4	1	2	7
Fire Stations	37	20	32	89
Police Stations	21	16	23	60
Schools	203	82	71	356
Airports	2	8	2	12
Ferries	2	0	3	5
Ports	31	9	18	58
Rail Facilities	10	0	3	13
Railway Bridges	130	26	59	215

Critical Facility	New Castle County	Kent County	Sussex County	Delaware
Highway Bridges	531	192	151	874
Communications	12	7	15	34
Electric Power Facilities	8	8	3	19
Oil Facilities	2	0	0	2
Wastewater Facilities	3	2	10	15

The critical facilities and infrastructure are mapped below in the three (3) counties within the State. All components of the built environment in the State have the potential to be directly or indirectly impacted by the identified hazards in Delaware.

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Due to Sensitive
Information

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Information

4.4.1.5 Cultural and Historical Resources

Another state asset and aspect of the built environment is cultural and historical resources. Delaware's historic properties and landscapes are recognized by all as essential to community character and quality of life, and their preservation is supported by a network of public and private stakeholders working with common goals. Historic landmarks and districts are important to consider when evaluating vulnerabilities to hazards. What is historic, and worth saving, varies with the beholder. "Historic" applies to a building that is part of a community's tangible past. Due to the advanced of these structures, they are highly susceptible to cracking, leaning, and total destruction caused by any of the hazards.

Historic buildings and structures, artwork, monuments, family heirlooms, and historic documents are often irreplaceable, and may be lost forever in a disaster if not considered in the mitigation planning process. The loss of these resources is all the more painful because of how often residents rely on their presence after a disaster, to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster. The State has a historic preservation plan that provides a framework for guiding public and private efforts to preserve Delaware's heritage for the future and serves as the State's historic preservation policy. The plan should also be viewed as part of state government's strategy for growth and change, correlated with the *Delaware Strategies for State Policies and Spending*, providing guidance for local actions.

The following table of historic properties are owned by the State of Delaware, Division of Historical & Cultural Affairs, and are operated by private organizations.

Table 82: Historical Properties Owned by the State[9]

Historical Properties Owned by the State		
Abbott's Mill Nature Center	Belmont Hall	Cooch-Dayett Mills
Fenwick Island Lighthouse	The Delaware Breakwater East End Lighthouse	Fort Christina National Historic Landmark
Robinson House	Hale-Byrnes House	The Old State House
Prince George's Chapel	Old Sussex County Court House	John Dickinson Plantation
Johnson Victrola Museum	New Castle Court House Museum	Zwaanendael Museum
Milford Museum	Pencader Heritage Museum	

There are roughly 200 historic properties in Delaware determined by the National Register of Historic Places (NRHP) to have a level of significance for the State, shown in Table 83. The local, jurisdictional governments are responsible for preserving these properties. The State of Delaware encourages the preservation and rehabilitation of such historic buildings through its Historic Preservation Tax Credit Program. The continued presence of historic properties in Delaware helps to establish sense of place and defines the very character of the community.

Table 83: Significant Historical Properties in the NRHP

Reference Number	Property Name	Category of Property	County	City	Area of Significance
74000596	Brecknock	BUILDING	Kent	Camden	INDUSTRY; ARCHITECTURE; AGRICULTURE
74000595	Camden Historic District	DISTRICT	Kent	Camden	COMMUNITY PLANNING AND DEVELOPMENT; ARCHITECTURE; RELIGION; SOCIAL HISTORY
71000217	Octagonal Schoolhouse	BUILDING	Kent	Cowgill's Corner	EDUCATION; ARCHITECTURE

[9] Other Historic Sites Owned by the State of Delaware - Division of Historical and Cultural Affairs - State of Delaware

Reference Number	Property Name	Category of Property	County	City	Area of Significance
72000277	Bradford-Loockerman House	BUILDING	Kent	Dover	ARCHITECTURE
77000384	Carey Farm Site	SITE	Kent	Dover	PREHISTORIC
72000278	Delaware State Museum Buildings	BUILDING	Kent	Dover	POLITICS/GOVERNMENT; RELIGION
72000279	Governor's House	BUILDING	Kent	Dover	ARCHITECTURE
73000489	Great Geneva	BUILDING	Kent	Dover	ARCHITECTURE; SOCIAL HISTORY
73000488	Greenwold	BUILDING	Kent	Dover	LANDSCAPE ARCHITECTURE; ARCHITECTURE
71000218	Loockerman Hall	BUILDING	Kent	Dover	ARCHITECTURE
72000280	Town Point	BUILDING	Kent	Dover	ARCHITECTURE
79000622	Victorian Dover Historic District	DISTRICT	Kent	Dover	INDUSTRY; COMMUNITY PLANNING AND DEVELOPMENT; COMMERCE; POLITICS/GOVERNMENT; ARCHITECTURE
71000220	Allee House	BUILDING	Kent	Dutch Neck Crossroads	ARCHITECTURE
82002313	Coombe Historic District	DISTRICT	Kent	Felton	ARCHITECTURE
79000623	Hughes Early Man Sites	SITE	Kent	Felton	PREHISTORIC
74000598	Cheyney Clow's Rebellion, Scene of	SITE	Kent	Kenton	MILITARY; POLITICS/GOVERNMENT
74000599	Somerville	BUILDING	Kent	Kenton	POLITICS/GOVERNMENT
82001026	Raymond Neck Historic District	DISTRICT	Kent	Leipsic	BLACK; ARCHITECTURE; SOCIAL HISTORY
84000286	Little Creek Hundred Rural Historic District	DISTRICT	Kent	Little Creek	ARCHITECTURE; AGRICULTURE
71000221	Lowber, Matthew, House	BUILDING	Kent	Magnolia	ARCHITECTURE
78000889	Truitt, Gov. George, House	BUILDING	Kent	Magnolia	POLITICS/GOVERNMENT; ARCHITECTURE
76000570	Vogl House	BUILDING	Kent	Masten's Corner	ARCHITECTURE
82002320	Archeological Site No. 7K F 4 and 23	SITE	Kent	Milford	PREHISTORIC
73000502	Christ Church	BUILDING	Kent	Milford	RELIGION
82002321	Lofland, Peter, House	BUILDING	Kent	Milford	ARCHITECTURE
83001354	McColley, James, House	BUILDING	Kent	Milford	COMMUNITY PLANNING AND DEVELOPMENT; POLITICS/GOVERNMENT; ARCHITECTURE
82002322	Milford New Century Club	BUILDING	Kent	Milford	EDUCATION; ARCHITECTURE
83001357	North Milford Historic District	DISTRICT	Kent	Milford	COMMUNITY PLANNING AND DEVELOPMENT; ARCHITECTURE
82002323	Watson, Gov. William T., Mansion	BUILDING	Kent	Milford	ARCHITECTURE
78000892	Wilkerson, J. H., & Son Brickworks	DISTRICT	Kent	Milford	INDUSTRY; HISTORIC - NON-ABORIGINAL
75002101	Delaware Boundary Markers	DISTRICT	Kent	Not Applicable	ENGINEERING; POLITICS/GOVERNMENT

Reference Number	Property Name	Category of Property	County	City	Area of Significance
76000571	Cow Marsh Old School Baptist Church	BUILDING	Kent	Sandtown	ARCHITECTURE; RELIGION
78000893	Dill Farm Site	SITE	Kent	Sandtown	PREHISTORIC
71000223	Belmont Hall	BUILDING	Kent	Smyrna	POLITICS/GOVERNMENT; ARCHITECTURE
72000282	Duck Creek Village	DISTRICT	Kent	Smyrna	INDUSTRY; ARCHITECTURE; SOCIAL HISTORY
82001027	Peterson and Mustard's Hermitage Farm	BUILDING	Kent	Smyrna	ARCHITECTURE; AGRICULTURE
80000930	Smyrna Historic District	DISTRICT	Kent	Smyrna	COMMERCE; ARCHITECTURE
82001863	Woodlawn	BUILDING	Kent	Smyrna	ARCHITECTURE
72000283	Island Field Site	SITE	Kent	South Bowers	PREHISTORIC
76002296	Brandywine Village Historic District (Boundary Increase)	DISTRICT	New Castle	Brandywine	COMMERCE; ENGINEERING; ARCHITECTURE
71000224	Center Meeting and Schoolhouse	BUILDING	New Castle	Centerville	ARCHITECTURE
74000600	Christiana Historic District	DISTRICT	New Castle	Christiana	COMMERCE; MILITARY; ARCHITECTURE
79000625	Public School No. 111-C	BUILDING	New Castle	Christiana	BLACK; EDUCATION; ARCHITECTURE; SOCIAL HISTORY
92001143	Archmere	BUILDING	New Castle	Claymont	COMMERCE; ARCHITECTURE
06000284	Hickman Row	DISTRICT	New Castle	Claymont	BLACK; ARCHITECTURE; COMMUNITY PLANNING AND DEVELOPMENT
71000225	Robinson House	BUILDING	New Castle	Claymont	INDUSTRY; MILITARY; ARCHITECTURE
82002325	Chelsea	BUILDING	New Castle	Delaware City	ARCHITECTURE; AGRICULTURE
83003515	Delaware City Historic District	DISTRICT	New Castle	Delaware City	TRANSPORTATION; EXPLORATION/SETTLEMENT; ARCHITECTURE
75000543	Eastern Lock of the Chesapeake and Delaware Canal	STRUCTURE	New Castle	Delaware City	ENGINEERING; TRANSPORTATION
82002326	Fairview	BUILDING	New Castle	Delaware City	ARCHITECTURE
71000226	Fort Delaware on Pea Patch Island	BUILDING	New Castle	Delaware City	MILITARY; ARCHITECTURE
99001275	Fort Dupont Historic District	DISTRICT	New Castle	Delaware City	MILITARY; ARCHITECTURE
86001314	Stewart, James, House	BUILDING	New Castle	Glascow	AGRICULTURE; ARCHITECTURE
09000050	Carney, John, Agricultural Complex	BUILDING	New Castle	Greenville	AGRICULTURE; CONSERVATION
03000172	Mount Cuba	BUILDING	New Castle	Greenville	ARCHITECTURE; LANDSCAPE ARCHITECTURE
10000597	Owl's Nest Country Place	BUILDING	New Castle	Greenville	SOCIAL HISTORY; ARCHITECTURE; LANDSCAPE ARCHITECTURE
12000165	Stockton-Montmorency	BUILDING	New Castle	Greenville	ARCHITECTURE
73000509	Coffee Run Mission Site	DISTRICT	New Castle	Hockessin	RELIGION

Reference Number	Property Name	Category of Property	County	City	Area of Significance
80000932	Wilmington and Western Railroad	DISTRICT	New Castle	Hockessin and	COMMERCE; ENGINEERING; TRANSPORTATION
82002327	Correll's Farm and Lawn Supply	BUILDING	New Castle	Kirkwood	TRANSPORTATION; ARCHITECTURE; AGRICULTURE
82002328	Dragon Run Farm	BUILDING	New Castle	Kirkwood	ARCHITECTURE
73000512	McCoy House	BUILDING	New Castle	Kirkwood	ENTERTAINMENT/RECREATION; ARCHITECTURE
82002329	Old Cann Mansion House	BUILDING	New Castle	Kirkwood	ARCHITECTURE; AGRICULTURE
82002330	Old Post Office	BUILDING	New Castle	Kirkwood	ARCHITECTURE
82002331	Point Farm	BUILDING	New Castle	Kirkwood	ARCHITECTURE; AGRICULTURE
73000513	Greenbank Historic Area	BUILDING	New Castle	Marshallton	INDUSTRY; COMMERCE; ENGINEERING; INVENTION
79003441	Greenbank Historic Area (Boundary Increase)	BUILDING	New Castle	Marshallton	INDUSTRY; COMMERCE; ENGINEERING; INVENTION
95001145	Johnson, William Julius "Judy" House	BUILDING	New Castle	Marshallton	ENTERTAINMENT/RECREATION
79000626	Achmester	DISTRICT	New Castle	Middletown	AGRICULTURE; ARCHITECTURE
87001508	Biggs, Gov. Benjamin T., Farm	BUILDING	New Castle	Middletown	AGRICULTURE; POLITICS/GOVERNMENT; ARCHITECTURE
73000514	Cochran Grange	BUILDING	New Castle	Middletown	AGRICULTURE; ARCHITECTURE
82002332	Hanson, B. F., House	BUILDING	New Castle	Middletown	ECONOMICS; ARCHITECTURE; SOCIAL HISTORY
73000519	Old St. Anne's Church	BUILDING	New Castle	Middletown	ARCHITECTURE; RELIGION; SOCIAL HISTORY
05000601	Air Service, Inc. Hangar at Bellanca Airfield	BUILDING	New Castle	New Castle	TRANSPORTATION; ARCHITECTURE
73000521	Glebe House	BUILDING	New Castle	New Castle	ARCHITECTURE
82002333	New Castle Ice Piers	STRUCTURE	New Castle	New Castle	ENGINEERING; TRANSPORTATION; MARITIME HISTORY
97001120	Penn Farm of the Trustees of the New Castle Common	BUILDING	New Castle	New Castle	AGRICULTURE; POLITICS/GOVERNMENT
77000387	Swanwyck	BUILDING	New Castle	New Castle	ARCHITECTURE
76000573	Academy of Newark	BUILDING	New Castle	Newark	EDUCATION
11000844	Carswell, Stuart Randall & Pricilla Kellogg, House	BUILDING	New Castle	Newark	ARCHITECTURE
73000528	Cooch's Bridge Historic District	DISTRICT	New Castle	Newark	INDUSTRY; MILITARY
97000790	Cooch's Bridge Historic District (Boundary Decrease)	DISTRICT	New Castle	Newark	MILITARY; INDUSTRY
78000901	Dean, Joseph, & Son Woolen Mill	BUILDING	New Castle	Newark	INDUSTRY; ARCHITECTURE

Reference Number	Property Name	Category of Property	County	City	Area of Significance
72001597	England House and Mill	BUILDING	New Castle	Newark	ARCHITECTURE
73000526	Old College Historic District	DISTRICT	New Castle	Newark	EDUCATION; ARCHITECTURE
72000287	Rotheram Mill House	BUILDING	New Castle	Newark	ARCHITECTURE
73000527	Welsh Tract Baptist Church	BUILDING	New Castle	Newark	ARCHITECTURE
79000630	Wooddale Historic District	DISTRICT	New Castle	Newport	INDUSTRY; HISTORIC - NON-ABORIGINAL; INVENTION
72000288	Appoquinimink Friends Meetinghouse	BUILDING	New Castle	Odessa	ARCHITECTURE; RELIGION
73000534	Beard, Duncan, Site	SITE	New Castle	Odessa	INDUSTRY; HISTORIC - NON-ABORIGINAL
77000390	Hell Island Site	SITE	New Castle	Odessa	PREHISTORIC
80000933	Monterey	BUILDING	New Castle	Odessa	AGRICULTURE; ARCHITECTURE; INVENTION
84000846	Odessa Historic District (Boundary Increase)	DISTRICT	New Castle	Odessa	COMMERCE; ARCHITECTURE
73000533	Old Drawyers Church	BUILDING	New Castle	Odessa	ARCHITECTURE
82002353	Old St. Paul's Methodist Episcopal Church	BUILDING	New Castle	Odessa	ARCHITECTURE; RELIGION
73000538	Dilworth House	BUILDING	New Castle	Port Penn	ARCHITECTURE
72000289	Rockland Historic District	DISTRICT	New Castle	Rockland	INDUSTRY; ARCHITECTURE
73000540	Clearfield Farm	BUILDING	New Castle	Smyrna	POLITICS/GOVERNMENT; ARCHITECTURE
73000541	Old Brick Store	BUILDING	New Castle	Smyrna	COMMERCE; TRANSPORTATION; AGRICULTURE
82002354	Bloomfield	BUILDING	New Castle	St. Georges	AGRICULTURE; ARCHITECTURE
71000228	Buena Vista	BUILDING	New Castle	St. Georges	POLITICS/GOVERNMENT; ARCHITECTURE; AGRICULTURE
82002355	Casperson, W., House	BUILDING	New Castle	St. Georges	ARCHITECTURE
82002356	Linden Hill	BUILDING	New Castle	St. Georges	ARCHITECTURE; AGRICULTURE
95001033	North Saint Georges Historic District	DISTRICT	New Castle	St. Georges	TRANSPORTATION; ARCHITECTURE
82002357	St. Georges Cemetery Caretaker's House	BUILDING	New Castle	St. Georges	ARCHITECTURE
84000263	St. Georges Presbyterian Church	BUILDING	New Castle	St. Georges	ARCHITECTURE
82002358	Starl House	BUILDING	New Castle	St. Georges	ARCHITECTURE
82002359	Vernacular Frame House	BUILDING	New Castle	St. Georges	ARCHITECTURE
77000391	Clyde Farm Site	SITE	New Castle	Stanton	PREHISTORIC; HISTORIC - NON-ABORIGINAL
72000290	Hale-Byrnes House	BUILDING	New Castle	Stanton	INDUSTRY; COMMERCE; MILITARY; ARCHITECTURE; RELIGION
73000545	Huguenot House	BUILDING	New Castle	Taylors Bridge	ARCHITECTURE

Reference Number	Property Name	Category of Property	County	City	Area of Significance
89000288	Reedy Island Range Rear Light	STRUCTURE	New Castle	Taylor's Bridge	ENGINEERING; MARITIME HISTORY
86001029	Townsend Historic District	DISTRICT	New Castle	Townsend	INDUSTRY; ARCHITECTURE
78000909	Augustine Paper Mill	BUILDING	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
84000439	Bancroft and Sons Cotton Mills	DISTRICT	New Castle	Wilmington	INDUSTRY; ARCHITECTURE; INVENTION
78000910	Beaver Valley Rock Shelter Site	SITE	New Castle	Wilmington	PREHISTORIC
84000819	Brandywine Powder Mills District	DISTRICT	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
71000229	Brandywine Village Historic District	DISTRICT	New Castle	Wilmington	INDUSTRY; HISTORIC - NON-ABORIGINAL; ENGINEERING; EDUCATION; ARCHITECTURE
71000230	Breck's Mill Area	DISTRICT	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
87000683	Breck's Mill Area-Henry Clay Village Historic District (Boundary Decrease)	DISTRICT	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
76000575	Brindley Farm	BUILDING	New Castle	Wilmington	INDUSTRY; COMMERCE; TRANSPORTATION; ARCHITECTURE; AGRICULTURE
73000547	Continental Army Encampment Site	SITE	New Castle	Wilmington	MILITARY
03000240	Delaware Academy of Medicine	BUILDING	New Castle	Wilmington	HEALTH/MEDICINE; SOCIAL HISTORY; ARCHITECTURE
98001098	Gibraltar	BUILDING	New Castle	Wilmington	ARCHITECTURE; LANDSCAPE ARCHITECTURE
79000633	Glynrich	BUILDING	New Castle	Wilmington	ARCHITECTURE
74000603	Laurel	BUILDING	New Castle	Wilmington	LANDSCAPE ARCHITECTURE; ARCHITECTURE
71000231	Louviers	BUILDING	New Castle	Wilmington	ARCHITECTURE
72000293	Lower Louviers and Chicken Alley	BUILDING	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
85003191	Main Office of the New Castle Leather Company	BUILDING	New Castle	Wilmington	INDUSTRY; ARCHITECTURE
89000287	Marcus Hook Range Rear Light	BUILDING	New Castle	Wilmington	ENGINEERING; MARITIME HISTORY
73000549	McLane, Louis, House	BUILDING	New Castle	Wilmington	POLITICS/GOVERNMENT
83001336	New Century Club	BUILDING	New Castle	Wilmington	ARCHITECTURE; SOCIAL HISTORY; PERFORMING ARTS
76000579	Rockwood	BUILDING	New Castle	Wilmington	LANDSCAPE ARCHITECTURE; COMMERCE; ARCHITECTURE
79000636	Schoonover, Frank E., Studios	BUILDING	New Castle	Wilmington	ART; ARCHITECTURE
83001339	St. Mary's School	BUILDING	New Castle	Wilmington	EDUCATION; ARCHITECTURE

Reference Number	Property Name	Category of Property	County	City	Area of Significance
73000550	Village of Arden	DISTRICT	New Castle	Wilmington	COMMUNITY PLANNING AND DEVELOPMENT; LANDSCAPE ARCHITECTURE; ART; POLITICS/GOVERNMENT; PERFORMING ARTS
72000296	Walker's Mill and Walker's Bank	BUILDING	New Castle	Wilmington	INDUSTRY; EDUCATION; ARCHITECTURE
76000581	Wilmington Amtrak Station	BUILDING	New Castle	Wilmington	TRANSPORTATION; ARCHITECTURE
06000282	Wilmington Club	BUILDING	New Castle	Wilmington	INDUSTRY; ARCHITECTURE; ENTERTAINMENT/RECREATION
80000939	Auburn Mills Historic District	DISTRICT	New Castle	Yorklyn	INDUSTRY; ARCHITECTURE
80004486	Garrett Snuff Mills Historic District	DISTRICT	New Castle	Yorklyn	INDUSTRY; COMMUNITY PLANNING AND DEVELOPMENT; ARCHITECTURE
79000640	Graves Mill Historic District	DISTRICT	New Castle	Yorklyn	INDUSTRY; ARCHITECTURE
76000582	Indian River Life Saving Service Station	BUILDING	Sussex	Bethany Beach	TRANSPORTATION
78003177	Poplar Thicket	SITE	Sussex	Bethany Beach	PREHISTORIC
14000617	Union Wesley Methodist Episcopal Church Complex	DISTRICT	Sussex	Clarksville	EDUCATION; RELIGION; SOCIAL HISTORY; BLACK
71000235	Prince George's Chapel	BUILDING	Sussex	Dagsboro	ARCHITECTURE
73000553	Highball Signal	OBJECT	Sussex	Delmar	TRANSPORTATION
79000642	Fenwick Island Lighthouse Station	BUILDING	Sussex	Fenwick Island	TRANSPORTATION; ARCHITECTURE
79000643	Chandler, Capt. Ebe, House	BUILDING	Sussex	Frankford	ARCHITECTURE
100004083	Allen, Richard, School	building	Sussex	Georgetown	ETHNIC HERITAGE; EDUCATION; BLACK
79000646	Judge's House and Law Office	BUILDING	Sussex	Georgetown	LAW; POLITICS/GOVERNMENT; ARCHITECTURE
71000236	Old Sussex County Courthouse	BUILDING	Sussex	Georgetown	POLITICS/GOVERNMENT; SOCIAL HISTORY
80000940	Redden Forest Lodge, Forester's House, and Stable	BUILDING	Sussex	Georgetown	OTHER; ARCHITECTURE
79000649	St. Paul's Episcopal Church	BUILDING	Sussex	Georgetown	ARCHITECTURE; RELIGION
73000554	Sussex County Courthouse and the Circle	BUILDING	Sussex	Georgetown	POLITICS/GOVERNMENT; ARCHITECTURE
79000650	Wright, Gardiner, Mansion	BUILDING	Sussex	Georgetown	ARCHITECTURE
14000532	Adams Home Farm	BUILDING	Sussex	Greenwood	
72000297	Old Christ Church	BUILDING	Sussex	Laurel	ARCHITECTURE
78000920	Cape Henlopen Archeological District	DISTRICT	Sussex	Lewes	PREHISTORIC

Reference Number	Property Name	Category of Property	County	City	Area of Significance
72000299	De Vries Palisade	SITE	Sussex	Lewes	HISTORIC - ABORIGINAL; COMMERCE
80000941	Fisher Homestead	BUILDING	Sussex	Lewes	ARCHITECTURE
76000585	Hall, Col. David, House	BUILDING	Sussex	Lewes	MILITARY; POLITICS/GOVERNMENT; ARCHITECTURE
92000462	Lewes Historic District (Boundary Increase)	DISTRICT	Sussex	Lewes	SOCIAL HISTORY; ARCHITECTURE
73000555	Pagan Creek Dike	STRUCTURE	Sussex	Lewes	COMMERCE; ENGINEERING
78000919	Townsend Site	SITE	Sussex	Lewes	PREHISTORIC
78000921	Wolfe's Neck Site	SITE	Sussex	Lewes	PREHISTORIC
72000300	Abbott's Mill	BUILDING	Sussex	Milford	INDUSTRY; AGRICULTURE
79003788	Abbott's Mill (Boundary Increase)	BUILDING	Sussex	Milford	INDUSTRY; ENGINEERING
82002364	Carlisle House	BUILDING	Sussex	Milford	ARCHITECTURE
83001355	Dawson, Dr., House	BUILDING	Sussex	Milford	ARCHITECTURE
82002365	Draper House	BUILDING	Sussex	Milford	ARCHITECTURE
83001359	Egglinton Hall	BUILDING	Sussex	Milford	AGRICULTURE; POLITICS/GOVERNMENT; ARCHITECTURE; RELIGION
83001410	Grier House	BUILDING	Sussex	Milford	ARCHITECTURE
83001356	Milford Railroad Station	BUILDING	Sussex	Milford	COMMERCE; ECONOMICS; TRANSPORTATION
83001411	Milford Shipyard Area Historic District	BUILDING	Sussex	Milford	TRANSPORTATION; ARCHITECTURE
83001358	South Milford Historic District	DISTRICT	Sussex	Milford	ARCHITECTURE
73000557	Carey's Camp Meeting Ground	DISTRICT	Sussex	Millsboro	RELIGION; SOCIAL HISTORY
79003309	Davis, Robert, Farmhouse	BUILDING	Sussex	Millsboro	AGRICULTURE; NATIVE AMERICAN
79003314	Harmon School	BUILDING	Sussex	Millsboro	NATIVE AMERICAN; BLACK; EDUCATION
79003315	Harmon, Isaac, Farmhouse	BUILDING	Sussex	Millsboro	NATIVE AMERICAN
79003308	Harmony Church	BUILDING	Sussex	Millsboro	NATIVE AMERICAN
79003311	Hitchens, Ames, Chicken Farm	BUILDING	Sussex	Millsboro	AGRICULTURE; NATIVE AMERICAN
79003307	Indian Mission Church	BUILDING	Sussex	Millsboro	NATIVE AMERICAN
79003312	Indian Mission School	BUILDING	Sussex	Millsboro	NATIVE AMERICAN; EDUCATION
78000922	Indian River Archeological Complex	DISTRICT	Sussex	Millsboro	PREHISTORIC
79003313	Johnson School	BUILDING	Sussex	Millsboro	NATIVE AMERICAN; BLACK; EDUCATION
79003310	Wright, Warren T., Farmhouse Site	SITE	Sussex	Millsboro	HISTORIC - ABORIGINAL; NATIVE AMERICAN
73000560	Ponder, Gov. James, House	BUILDING	Sussex	Milton	POLITICS/GOVERNMENT; ARCHITECTURE
78000926	Thompsons Island Site	SITE	Sussex	Rehoboth Beach	HISTORIC - ABORIGINAL; PREHISTORIC
77000398	Warrington Site	SITE	Sussex	Rehoboth Beach	PREHISTORIC

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Since 1990, the state has invested over $250 million to preserve about 60,000 acres of open spaces, including forests, wetlands, and agricultural fields that buffer these areas and provide habitat.

In 2012, 74.3% of the built lands in Kent County were in residential development. In New Castle County, 66.9% were residential. In Sussex County, 79.9% were in residential uses.

Land Use Distributions within Built Areas 2012 Land Use/Land Cover Data

	Kent		New Castle		Sussex		State of Delaware	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Residential/Other Urban	43,335	74.29%	77,006	66.91%	75,141	79.92%	**195,482**	**73.09%**
Commercial	4,573	7.84%	14,725	12.79%	6,913	7.35%	**26,212**	**9.80%**
Transportation/Utility	5,220	8.95%	9,335	8.11%	4,626	4.92%	**19,180**	**7.17%**
Institutional	2,594	4.45%	6,162	5.35%	2,639	2.81%	**11,396**	**4.26%**
Recreation	2,606	4.47%	7,862	6.83%	4,706	5.01%	**15,174**	**5.67%**
Total Built	**58,328**	**100%**	**115,090**	**100%**	**94,026**	**100%**	**267,444**	**100%**

Source: 2012 Delaware Land-use/Land-cover Data

Figure 51: 2012 Land Use Distributions within Built Areas

4.4.3 Factors that Affect Vulnerabilities

According to FEMA, the definition of vulnerability is *"the susceptibility of people, property, industry, resources, ecosystems, or historic buildings and artifacts to the negative impact of a disaster*." This section identifies elements that increase Delaware's vulnerability to hazards as well as elements that decrease their vulnerability.

4.4.3.1 Factors that Increase Vulnerability

Climate Change

In Delaware, climate change primarily takes the form of sea level rise, increasing temperatures and more frequent intense storms, including heavy precipitation and flooding. The potential impacts from each of these threatens the state's industries, infrastructure, natural resources and health of residents in the following ways:

- Commerce, tourism, and recreation in the Northeast depend on the coast and ocean. Warmer ocean temperatures, sea level rise, and ocean acidification threaten these services. As climate risks increase, the adaptive capacity of marine ecosystems and coastal communities will influence ecological and socioeconomic outcomes.
- Changing climate threatens the health and well-being of people in the Northeast through more extreme weather, warmer temperatures, degradation of air and water quality, and sea level rise. Additional deaths, emergency room visits and hospitalizations, and a lower quality of life are expected as these environmental changes continue.
- Climate change potential impacts in the Northeast—including extreme precipitation events, sea level rise, coastal and riverine flooding and heat waves—will challenge its environmental, social, and economic systems, increasing the vulnerability of its residents, especially its most disadvantaged populations.

According to the Delaware Climate Change Impact Assessment (DCCIA), annual maximum (daytime) temperature is projected to increase by an average of 2°–2.5°F and annual minimum (nighttime) temperature by an average of 1.5°–2.5°F by 2039. In the near term (2020–2039), extreme heat waves

are projected to occur 3 out of every 5 years. Projections for midcentury show an average of 1 extreme heat wave per year under the lower scenario and up to 10 extreme heat waves per year by the end of the century under the higher scenario.

Higher temperatures and extreme heat events in the future may result in decreased air quality and related health risks for Delaware residents. However, future cold waves are projected to be not as cold.

The Delaware Coastal Management Program Section 309 Enhancement Program 2021-2025 Assessment and Strategy states that coastal and nontidal wetlands are particularly vulnerable to climate change and its associated impacts, especially sea level rise, increased storm frequency and intensity, and changes in rainfall resulting in increased flooding and prolonged droughts. Impacts to these sensitive habitats are seen both physically and ecologically, negatively affecting their abilities to function and provide healthy habitats and nursery grounds, sequester carbon, improve water quality, and buffer storms. Delaware's coastal wetlands are particularly vulnerable due to the state's low-lying elevations and high subsidence rates, resulting in increasing inundation by rising tides and erosion from more frequent coastal storms. Increased temperatures and variation in precipitation patterns, resulting in longer dry period or increase floods are likely affecting nontidal wetlands.

While incorporating data from the DCCIA, the Economic Analysis of the Impacts of Climate Change in the State of Delaware acknowledges the impact of climate change on economic sectors over the next century. The total economic impact by late century for all five sectors (Agriculture, Public Safety, Health, Natural Resources, Transportation) is well over $1 billion annually (2019$). All sectors are expected to experience a noticeable increase in impacts by late century as compared to the earlier portion of the century.

This increase is particularly prominent in the transportation sector, which sees a 12-fold increase under both the high and low emission scenarios, primarily driven by temperature, precipitation, and high tide flooding delays on roads. In contrast, natural resource damages, driven by water quality and ecosystem services losses, result in high levels of economic impact early in the century, which continue to grow through late century.

Sea Level Rise

Sea level rise causes land loss in low-lying coastal areas, such as coastal wetlands and barrier islands, and occurs at the highest rates where land is already subsiding. Sea level rise also exacerbates erosion and flooding as new areas become vulnerable to storm surge, wave action, and tides.[10]

[10] Adapting to Climate Change: A Planning Guide for State Coastal Managers, National Oceanic and Atmospheric Administration Office of Ocean and Coastal Resource Management, 2010.

Climate change models predict that sea level risk will accelerate in the next century. This could result in billions of dollars in losses.

Because of its location, low average elevation, and dependence on the coast, Delaware is particularly vulnerable to the effects of rising sea levels including loss of low-lying land and structures, saltwater intrusion into ground and surface waters, and increased coastal flooding from storm events.

According to Delaware's Sea Level Rise Vulnerability Assessment, inundation from sea level rise will occur in all three of Delaware's counties, affecting a range of resources.

Although the direct potential impacts from sea level rise inundation will be felt primarily in areas near tidal waters, every Delawarean is likely to be affected by sea level rise whether through increased costs of maintaining public infrastructure, decreased tax base, loss of recreational opportunities and wildlife habitat, or loss of community character. Statewide, between 8% and 11% of the state's land area (including wetlands) could be inundated by a sea level rise of 0.5 meters to 1.5 meters, respectively.

Within those potentially inundated areas lie transportation and port infrastructure, historic fishing villages, resort towns, agricultural fields, wastewater treatment facilities and vast stretches of wetlands and wildlife habitat of hemispheric importance.

The Coastal Zone Act, passed by the Delaware General Assembly in 1971, prohibited future heavy industrial development and created a permitting program for manufacturing activities within Delaware's coastal zone. The Act created a conversion permit that allows additional or alternative heavy industry uses on 14 grandfathered sites which were in operation when the Coastal Zone Act was passed in 1971.

Various heavy industry activities remain prohibited within the coastal zone, such as oil refineries, paper mills, incinerators, steel manufacturing plants, and liquefied natural gas terminals.

Population Increase

Sea level along the U.S. coastline is projected to rise, on average, 10 - 12 inches (0.25 - 0.30 meters) in the next 30 years (2020 - 2050)... The result will be a profound shift in coastal flooding over the next 30 years as tide and storm surge heights increase and reach further inland.

Coastal Inundation (arcgis.com)

Population growth and distribution, especially increased population density and urbanization, increases vulnerability to disasters. The elderly, very young, those without air conditioning or heating, and outdoor laborers are most at risk to the effects of extreme heat and winter storms. State residents living in a floodplain are most at risk to flooding and residents living in the Wildland-Urban Interface (WUI) are most at risk to wildfires. Those living in poverty and in homes not built using enhanced building codes are most susceptible to the damages of all the natural hazards. The following table reflects the **estimated** changes in participating jurisdictions' populations.

Table 88: Estimated Population Change

Populations	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Population Estimates, July 1 2021, (V2021)	184,149	571,708	247,527	1,003,384
Population estimates base, April 1, 2020, (V2021)	*181,851*	*570,719*	*237,378*	*989,948*

Populations	Kent County, Delaware	New Castle County, Delaware	Sussex County, Delaware	Delaware
Population, percent change - April 1, 2020 (estimates base) to July 1, 2021, (V2021)	**1.30%**	**0.20%**	**4.30%**	**1.40%**
Population, Census, April 1, 2020	181,851	570,719	237,378	989,948
Population, Census, April 1, 2010	*162,310*	*538,479*	*197,145*	*897,934*

NFIP Repetitive Loss & Severe Repetitive Loss Properties

Among the National Flood Insurance Policy (NFIP) policyholders are thousands whose properties have flooded multiple times. Called “repetitive loss properties,” these are buildings and/or contents for which the NFIP has paid at least two claims of more than $1,000 in any 10-year period since 1978. “Severe repetitive loss properties” are those for which the program has either made at least four payments for buildings and/or contents of more than $5,000 or at least two building-only payments that exceeded the value of the property.

These two kinds of properties are the biggest draw on the NFIP Fund. They not only increase the NFIP’s annual losses and the need for borrowing; but they drain funds needed to prepare for catastrophic events. Community leaders and residents should also be concerned with the Repetitive Loss problem because residents’ lives are disrupted and may be threatened by the continual flooding. The primary objective of identifying these properties is to eliminate or reduce the damage to property and the disruption to life caused by repeated flooding of the same properties.

As of January 1, 2023, there are 450 repetitive loss (RL) properties and 112 severe repetitive loss (SRL) properties on record in Delaware. That’s an increase of 80 RL properties since 2018 and decrease of 30 SRL properties since 2018.

Table 89: RL/SRL Properties by County

Jurisdiction	Repetitive Loss	*2018 RL*	Severe Repetitive Loss	*2018 SRL*	Total
Kent County Total	**40**	***33***	**11**	***12***	**51**
Bowers	9	*6*	2	*2*	**11**
Dover	1	*2*	-	-	**1**
Little Creek	1	*1*	-	-	**1**
Milford	8	*4*	2	*3*	**10**
Smyrna	1	-	1	*1*	**2**
Other	20	*20*	6	*6*	**26**
New Castle County Total	**129**	***115***	**49**	***52***	**178**
Delaware City	2	*2*	-	-	**2**
Elsmere	3	*1*	1	*2*	**4**
New Castle (City)	3	*2*	-	-	**3**
Newark	7	*3*	2	*2*	**9**
Wilmington	18	*11*	2	*4*	**20**
Other	96	*96*	44	*44*	**140**
Sussex County Total	**281**	***222***	**52**	***78***	**333**
Bethany Beach	52	*40*	2	*9*	**54**

Jurisdiction	Repetitive Loss	*2018 RL*	Severe Repetitive Loss	*2018 SRL*	Total
Dewey Beach	33	*14*	5	*12*	**38**
Fenwick Island	17	*14*	1	*1*	**18**
Lewes	16	*15*	-	*-*	**16**
Millsboro	1	*1*	-	*-*	**1**
Milton	1	-	1	*1*	**2**
Ocean View	1	*1*			**1**
Rehoboth Beach	9	*2*	1	*3*	**10**
Slaughter Beach	1	*1*			**1**
South Bethany	45	*29*	2	*12*	**47**
Other	105	*105*	40	*40*	**145**

Actions are being taken by the State to address these properties, though further details are not available at this time. As new State NFIP staff come on board, creating an action plan will be on of their goals.

New Development

Unsustainable development is one of the major factors in the rising costs of natural disasters. Many mitigation design strategies and technologies serve double duty, by not only preventing or reducing disaster losses but serving the broader goal of long-term community sustainability. For example, land use regulations prohibiting development in flood-prone areas may also help preserve the natural and beneficial functions of floodplains.

New development in hazard-prone areas increases the risk of damage and injury from that hazard. The biggest risk is damage from coastal erosion, coastal flooding, and tropical cyclones on future coastal development. All future development is vulnerable to severe weather events. Currently, future commercial and residential development is planned along the coast that must be mitigated.

Wildland-Urban Interface

Over the past century, housing growth has outpaced population growth in the United States, with extensive residential development in the outlying fringes of metropolitan areas and in rural areas with attractive recreational and aesthetic amenities, such as forests. This development is increasing the wildland-urban interface (WUI), that area where structures and other human development meet or intermingle with undeveloped wildland. The expansion of the WUI in recent decades has significant implications for wildfire management and impact, as well as broader natural resource concerns such as pollution, spread of invasive species, and loss of biodiversity. According to the US Fire Administration, Delaware has one of the lowest WUI densities in the United States, with 1.7-15% of total homes located in the WUI.

Wildfires can cause significant damage to property and threatens the lives of people who are unable to evacuate WUI areas. All improved property, critical facilities, and critical structures and infrastructure located in these wildfire-prone areas are considered vulnerable and can be exposed to this hazard.

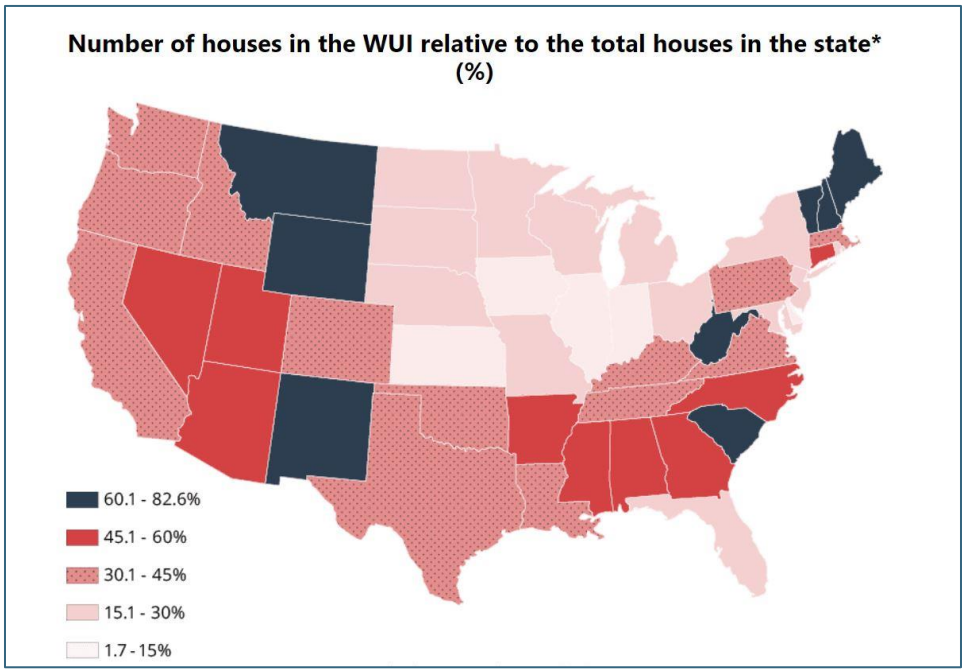

Figure 52: WUI Density

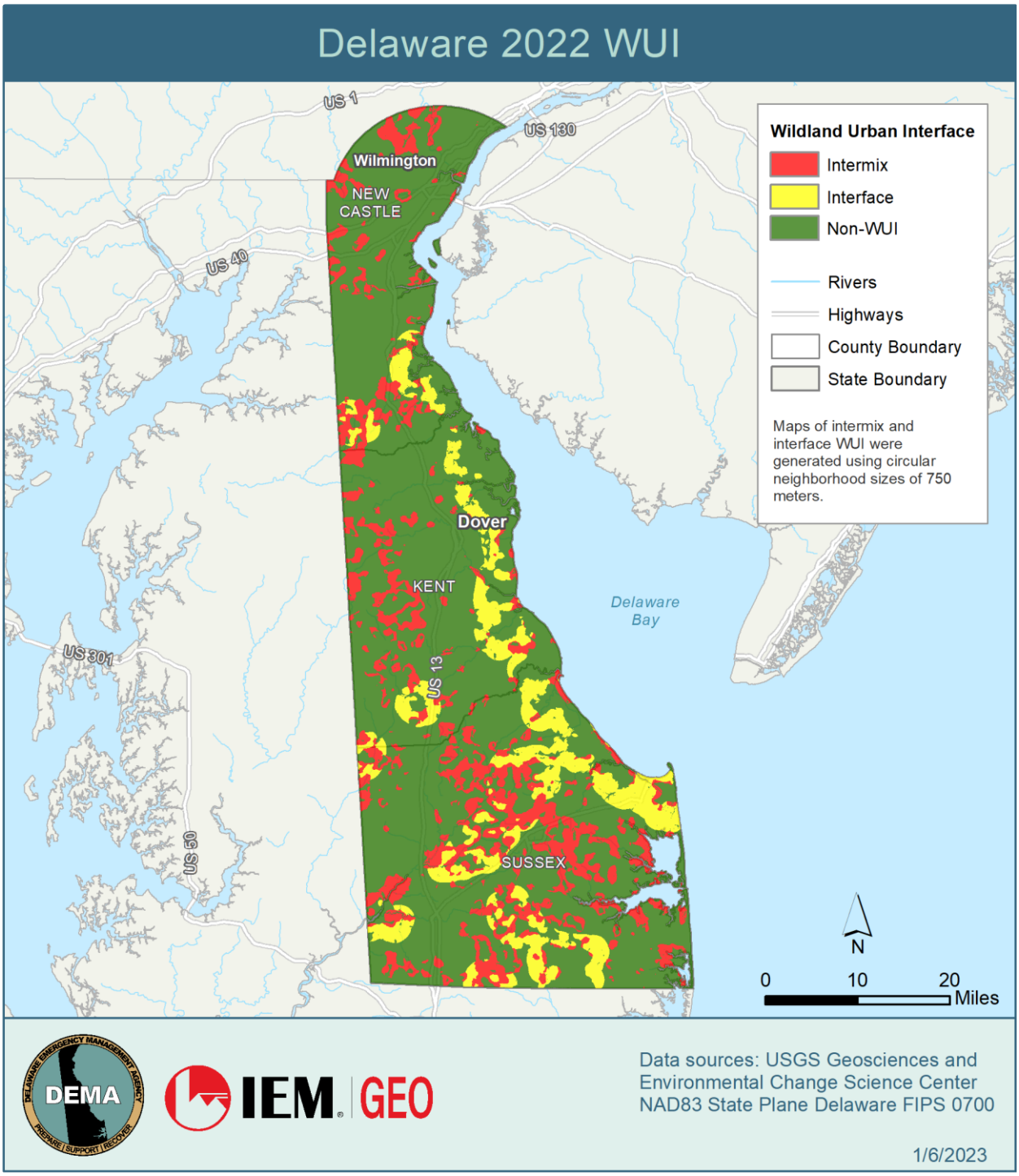

Figure 53: Delaware 2022 WUI Map

For the legend in the WUI Map above, the terms *intermix* and *interface* were used to describe the areas. The mapping algorithm utilized definitions of the WUI from the U.S. Federal Register (USDA & USDI, 2001) and Radeloff et al. (2005).

According to these definitions, two classes of WUI were identified: 1) the intermix, where there is at least 50% vegetation cover surrounding buildings, and 2) the interface, where buildings are within 2.4 km of a patch of vegetation at least 5 km2 in size that contains at least 75% vegetation. Both classes required a minimum building density of 6.17 buildings per km2. Maps of intermix and interface WUI were generated using a range of circular neighborhood sizes, based on radius distances from 100 – 1,500 m, to determine building density and vegetation cover on a pixel-by-pixel basis

4.4.3.2 Factors that Decrease Vulnerability

Factors that decrease vulnerability to hazards include the mitigation actions that have been implemented, the adoption of new codes and policies, and the participation in regional projects.

Implemented Mitigation Activities

Delaware has implemented a variety of mitigation actions to protect assets from disasters, either funded by grants or financed in-house. The 2018 mitigation actions and new mitigation are described in **Section 6** of this plan.

FEMA's Hazard Mitigation Assistance (HMA) grants have funded many statewide projects since 2000. These projects are listed in the table below. In addition to the projects funded by FMA, PDM, and HMGP, Delaware was awarded a BRIC grant in 2021 to update their state hazard mitigation plan.

FEMA's HMGP Post Fire, HHPD, or PA Mitigation funding sources have not been awarded due to projects or applicants either are not meeting qualifications for some programs, competing against prioritized projects from other states, or not applying to funding due to current capabilities.

Table 90: Statewide FEMA-HMA Funded Hazard Mitigation Projects

Program FY	Program Area	Project ID	Project Type	Status	Sub-grantee	Project Amount	Federal Share Obligated
2000	PDM	DR-9014-0001-R	90.6: Mitigation Plan - State Multi-hazard Mitigation Plan	Closed	DEMA	$358,651	$268,988
2000	FMA	FMA-PJ-03DE-2000005	403.3: Stormwater Management - Flap gates/ Floodgates	Closed	New Castle County *	$97,500	$97,500
2000	FMA	FMA-PJ-03DE-2000002	202.2: Elevation of Private Structures - Coastal	Closed	-	$4,821	$3,615
2000	FMA	FMA-PJ-03DE-2000001	202.2: Elevation of Private Structures - Coastal	Closed	-	$4,024	$3,018
2000	FMA	FMA-PJ-03DE-2000003	202.2: Elevation of Private Structures - Coastal	Closed	-	$4,900	$3,675
2001	FMA	FMA-PJ-03DE-2001003	202.2: Elevation of Private Structures - Coastal	Closed	Statewide	$22,293	$16,720

Program FY	Program Area	Project ID	Project Type	Status	Sub-grantee	Project Amount	Federal Share Obligated
2001	FMA	FMA-PJ-03DE-2001001	405.1: Other Minor Flood Control	Closed	New Castle County *	$160,000	$50,000
2001	FMA	FMA-PL-03DE-2001001	FMA Plan	Awarded	-	$13,300	$13,300
2002	FMA	FMA-PJ-03DE-2002002	800.1: Miscellaneous	Closed	Sussex County*	$51,657	$38,743
2002	FMA	FMA-PL-03DE-2002001	FMA Plan	Awarded	-	$13,300	$13,300
2003	HMGP	DR-1494-0002-F	600.1: Warning Systems (as a Component of a Planned, Adopted, and Exercised Risk Reduction Plan)	Closed	Statewide	$19,572	$14,679
2003	HMGP	DR-1494-0001-M	700.1: Management Costs - Salaries	Closed	Statewide	$11,284	$8,463
2003	HMGP	DR-1495-0001-F	600.1: Warning Systems (as a Component of a Planned, Adopted, and Exercised Risk Reduction Plan)	Closed	Statewide	$2,640	$1,980
2003	HMGP	DR-1495-0002-M	700.1: Management Costs - Salaries	Closed	Statewide	$455	$341
2003	FMA	FMA-PJ-03DE-2003001	204.3: Dry Floodproofing Public Structures – Riverine	Closed	New Castle County *	$133,707	$100,280
2003	FMA	FMA-PJ-03DE-2003002	200.1: Acquisition of Private Real Property (Structures and Land) - Riverine	Approved	Statewide	$1,046,000	$784,500
2003	PDM	DR-9088-0001-R	90.4: Mitigation Plan - Local Multi-hazard Mitigation Plan	Closed	DEMA	$331,166	$248,375
2004	FMA	FMA-PJ-03DE-2004001	204.1: Dry Floodproofing Private Structures - Riverine (Commercial)	Approved	New Castle County *	$212,100	$141,400

Program FY	Program Area	Project ID	Project Type	Status	Sub-grantee	Project Amount	Federal Share Obligated
2005	FMA	FMA-PL-03-DE-2005-001	95.1: FMA or CRS Plan	Obligated	DNREC	$17,867	$13,400.25
2005	FMA	FMA-TA-03-DE-2005-001	701.2: Technical Assistance - Application Development /Review	Obligated	DNREC	$18,827	$14,120.25
2006	HMGP	DR-1654-0002-M	700.1: Management Costs - Salaries	Closed	Statewide	$1,404	$1,053
2006	FMA	FMA-TA-03-DE-2006-001	701.2: Technical Assistance - Application Development /Review	Obligated	DNREC	$63,680	$47,760
2007	PDM	PDMC-PL-03-DE-2007-003	91.1: Local Multi-hazard Mitigation Plan	Obligated	DEMA	$111,850	$83,887.50
2007	PDM	PDMC-TA-03-DE-2007-002	700.1: Management Costs - Salaries; 700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Obligated	DEMA	$11,440	$8,580
2008	PDM	PDMC-PL-03-DE-2008-001	91.1: Local Multi-hazard Mitigation Plan	Obligated	University of Delaware	$87,300.86	$55,107.86
2008	PDM	PDMC-MC-03-DE-2008-002	700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Obligated	DEMA	$8,730	$6,547.50
2010	HMGP	DR-1896-0001-F	100.1: Public Awareness and Education (Brochures, Workshops, Videos, etc.)	Closed	University of Delaware	$48,817	$36,584
2010	HMGP	DR-1896-0005-M	700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Closed	Statewide	$9,268	$9,299
2010	PDM	PDMC-MC-03-DE-2010-003	700.2: Management Costs -	Obligated	DEMA	$30,000	$22,500

Program FY	Program Area	Project ID	Project Type	Status	Sub-grantee	Project Amount	Federal Share Obligated
			Equipment; 700.4: Management Costs - Supplies				
2011	HMGP	DR-4037-0002-F	403.2: Stormwater Management - Diversions; 800.1: Miscellaneous	Closed	DNREC	$65,900	$16,475
2013	HMGP	DR-4090-0001-M	700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Closed	Statewide	$6,118	$6,118
2015	PDM	PDMC-PJ-03-DE-2015-002	200.1: Acquisition of Private Real Property (Structures and Land) - Riverine	Obligated	New Castle County	$214,000	$160,500
2016	HMGP	DR-4265-0002-F	602.1: Other Equipment Purchase and Installation	Closed	DE DoT	$13,725	$8,023.01
2016	HMGP	DR-4265-0001-M	700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Closed	Statewide	$3,468.38	$3,468.38
2021	HMGP	DR-4566-0005-M	700.1: Management Costs - Salaries; 700.2: Management Costs - Equipment; 700.4: Management Costs - Supplies	Approved	Statewide	$170,244.99	$170,244.99

National Policy

On October 5, 2018, President Trump signed the Disaster Recovery Reform Act of 2018 (DRRA) into law as part of the Federal Aviation Administration Reauthorization Act of 2018. These reforms acknowledge the shared responsibility of disaster response and recovery, aim to reduce the complexity of FEMA and build the nation's capacity for the next catastrophic event. The law contains more than 50

provisions that require FEMA policy or regulation changes for full implementation, as they amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

It has yet to be seen how the DRRA will be implemented and how it will impact state and local agencies, but highlights from the DRRA include:

Highlights from the DRRA include:

- Greater investment in mitigation, before a disaster: Authorizing the National Public Infrastructure Pre-Disaster Hazard Mitigation Grant Program, which will be funded through the Disaster Relief Fund as a six percent set aside from disaster expenses.
    - This program will focus on funding public infrastructure projects that increase community resilience before a disaster occurs.
    - Previously, funding for pre-disaster mitigation grants relied on congressional appropriations which varied from year to year. Now, with a reliable stream of sufficient funding, communities will be able to plan and execute mitigation programs to reduce disaster risk nationwide.
    - According to a 2017 National Institute of Building Sciences report, the nation saves six dollars in future disaster costs for every one dollar invested in mitigation activities.
- Reducing risk from future disasters after fire: Providing hazard mitigation grant funding in areas that received Fire Management Assistance Grants as a result of wildfire. Adding fourteen new mitigation project types associated with wildfires and windstorms.
- Increasing state capacity to manage disaster recovery: Allowing for higher rates of reimbursement to state, local and tribal partners for their administrative costs when implementing public assistance (12 percent) and hazard mitigation projects (15 percent). Additionally, the legislation provides flexibility for states and tribes to administer their own post-disaster housing missions, while encouraging the development of disaster housing strategies.
    - States, tribes, territories and local governments bear significant administrative costs implementing disaster recovery programs. Often these costs can be high and substantially burdensome for the impacted entity to meet. Increasing the funding for administrative costs will enable faster, more effective delivery of vital recovery programs to communities.
    - State and tribal officials have the best understanding of the temporary housing needs for survivors in their communities. This provision incentivizes innovation, cost containment and prudent management by providing general eligibility requirements while allowing them the flexibility to design their own programs.
- Providing greater flexibility to survivors with disabilities: Increasing the amount of assistance available to individuals and households affected by disasters, including allowing accessibility repairs for people with disabilities, without counting those repairs against their maximum disaster assistance grant award.
- Retaining skilled response and recovery personnel: Authorizing FEMA to appoint certain types of temporary employees who have been with the agency for three continuous years to full time positions in the same manner as federal employees with competitive status. This allows the agency to retain and promote talented, experienced emergency managers.

In 2021, President Biden approved more than $3.46 billion to increase resilience to the potential impacts of climate change nationwide. This significant investment will be available for natural hazard mitigation measures across the 59 major disaster declarations issued due to the COVID-19 global pandemic. With the growing climate change crisis facing the nation, FEMA's Hazard Mitigation Grant Program will provide funding to states, tribes, and territories for mitigation projects to reduce the potential impacts of climate change.

Every state, tribe, and territory that received a major disaster declaration in response to the COVID-19 pandemic will be eligible to receive 4% of those disaster costs to invest in mitigation projects that reduce risks from natural disasters.

This influx of funding will help communities prioritize mitigation needs for a more resilient future, including underserved communities that are most vulnerable to the potential impacts of climate change. These projects can help address effects of climate change and other unmet mitigation needs, including using funds to promote equitable outcomes in underserved communities.

Another national action occurring in 2021 was that creation of the Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act that became law on January 1, 2021. This bill authorizes FEMA to enter into agreements with any state or Indian tribal government to make capitalization grants for the establishment of hazard mitigation revolving loan funds. Such funds shall provide funding assistance to local governments to carry out projects to reduce disaster risks for homeowners, businesses, nonprofit organizations, and communities in order to decrease the loss of life and property, the cost of insurance claims, and federal disaster payments. The Act amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

As dollar losses increase along with number of disaster declarations, it is expected that National Policy will continue playing a huge part in community resilience.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically. When a community participates in the NFIP, it participates in one of two phases/programs: Emergency Program or Regular Program.

- Emergency Program: Entry-level participation phase.
  - Limited coverage
  - Flat rates
  - Basic Flood Hazard Boundary Map (FHBM)*
    **Initial flood hazard identification*

- Regular Program: Most participating communities are in this phase.
  - Full participation
  - Detailed Flood Insurance Rate Map (FIRM)
  - NFIP's full limits of insurance

There are fifty (50) communities in Delaware that participate in the NFIP. Out of those 50, eleven (11) participate in the Community Rating System (CRS). More details on the State's NFIP capabilities are described in Section 5 of this plan.

Flood Insurance Risk Zones means zone designations on Flood Hazard Boundary Map (FHBM) and Flood Insurance Rate Map (FIRM) that indicate the magnitude of the flood hazard in specific areas of a community. The zone categories are below:

Table 91: Flood Insurance Risk Zones

High Risk Area	Description
In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.	

High Risk Area	Description
Zone A	Special flood hazard areas inundated by the 100-year flood; base flood elevations are not determined. Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
Zone AE	Special flood hazard areas inundated by the 100-year flood; base flood elevations are determined. The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
Zone A1-30	Special flood hazard areas inundated by the 100-year flood; base flood elevations are determined. These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
Zone AO	Special flood hazard areas inundated by the 100-year flood; with flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
Zone AH	Special flood hazard areas inundated by the 100-year flood; flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations are determined. Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Zone A99	Special flood hazard areas inundated by the 100-year flood to be protected from the 100-year flood by a Federal flood protection system under construction; no base flood elevations are determined. Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

Moderate to Low Risk Area	Description
In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones.	
Zone B and Zone X (shaded)	Areas of 500-year flood; areas subject to the 100-year flood with average depths of less than 1 foot or with contributing drainage area less than 1 square mile; and areas protected by levees from the base flood. Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
Zone C and Zone X (un-shaded)	Areas determined to be outside the 500-year floodplain. Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.

Undetermined Risk Area	Description
Zone D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

The following table reflects the number of active NFIP policies in force statewide.[11]

Table 92: NFIP Policies in Delaware as of 04/30/22

County	Community Name (Number)	Policies in Force	Total Coverage	Total Written Premium + FPF
KENT COUNTY	BOWERS, TOWN OF (100002)	97	$22,675,400	$88,004
KENT COUNTY	CAMDEN, TOWN OF (100003)	15	$4,732,000	$7,267
KENT COUNTY	CHESWOLD, TOWN OF (100004)	3	$805,000	$1,430
KENT COUNTY	CLAYTON, TOWN OF (100005)	3	$943,800	$2,148
KENT COUNTY	DOVER, CITY OF (100006)	130	$38,746,200	$113,334
KENT COUNTY	FELTON, TOWN OF (100008)	4	$1,050,000	$2,038
KENT COUNTY	FREDERICA, TOWN OF (100009)	6	$1,473,000	$4,534
KENT COUNTY	HARRINGTON, CITY OF (100010)	5	$1,145,600	$2,888
KENT COUNTY	KENT COUNTY * (100001)	510	$138,166,000	$443,527
KENT COUNTY	LEIPSIC, TOWN OF (100014)	18	$3,465,600	$35,381
KENT COUNTY	LITTLE CREEK, TOWN OF (100015)	18	$3,513,700	$19,329
KENT COUNTY	MILFORD, CITY OF (100042)	28	$10,051,200	$82,687
KENT COUNTY	SMYRNA, TOWN OF (100017)	19	$6,115,100	$10,029
KENT COUNTY	Unknown (Unknown)	43	$13,145,000	$41,832
KENT COUNTY	WYOMING, TOWN OF (100020)	5	$1,594,300	$2,500
NEW CASTLE COUNTY	ARDENTOWN, VILLAGE OF (100058)	2	$652,500	$1,809
NEW CASTLE COUNTY	ARDEN, VILLAGE OF (100052)	1	$350,000	$519
NEW CASTLE COUNTY	BOWERS, TOWN OF (100002)	1	$350,000	$617
NEW CASTLE COUNTY	DELAWARE CITY, CITY OF (100022)	127	$32,431,200	$137,252
NEW CASTLE COUNTY	ELSMERE, TOWN OF (100023)	68	$16,116,800	$128,824
NEW CASTLE COUNTY	KENT COUNTY * (100001)	1	$350,000	$467
NEW CASTLE COUNTY	MELBOURNE, CITY OF (120025)	1	$567,000	$947
NEW CASTLE COUNTY	MIDDLETOWN, TOWN OF (100024)	52	$15,988,600	$28,421
NEW CASTLE COUNTY	NEWARK, CITY OF (100025)	145	$45,193,500	$153,547
NEW CASTLE COUNTY	NEW CASTLE, CITY OF (100026)	197	$53,191,200	$277,623
NEW CASTLE COUNTY	NEW CASTLE COUNTY * (105085)	1,305	$377,390,700	$1,207,641

[11] nfip_policy-information-by-state_20220430.xlsx (live.com)

County	Community Name (Number)	Policies in Force	Total Coverage	Total Written Premium + FPF
NEW CASTLE COUNTY	SMYRNA, TOWN OF (100017)	1	$759,400	$3,322
NEW CASTLE COUNTY	Unknown (Unknown)	89	$26,906,000	$129,058
NEW CASTLE COUNTY	WILMINGTON, CITY OF (100028)	760	$209,486,500	$612,252
SUSSEX COUNTY	BETHANY BEACH, TOWN OF (105083)	1,872	$517,465,100	$1,666,367
SUSSEX COUNTY	BETHEL, TOWN OF (100055)	1	$225,000	$2,222
SUSSEX COUNTY	BLADES, TOWN OF (100031)	7	$1,666,300	$6,634
SUSSEX COUNTY	BRIDGEVILLE, TOWN OF (100032)	13	$3,720,000	$5,730
SUSSEX COUNTY	CLAYTON, TOWN OF (100005)	2	$700,000	$982
SUSSEX COUNTY	DAGSBORO, TOWN OF (100033)	14	$3,994,800	$11,061
SUSSEX COUNTY	DELMAR, TOWN OF (100059)	3	$980,000	$1,372
SUSSEX COUNTY	DEWEY BEACH, TOWN OF (100056)	1,109	$271,547,500	$788,008
SUSSEX COUNTY	FENWICK ISLAND, TOWN OF (105084)	533	$156,723,500	$591,695
SUSSEX COUNTY	GEORGETOWN, TOWN OF (100062)	9	$2,405,000	$3,819
SUSSEX COUNTY	GREENWOOD, TOWN OF (100039)	26	$6,618,900	$27,619
SUSSEX COUNTY	HENLOPEN ACRES, TOWN OF (100053)	68	$22,049,000	$92,057
SUSSEX COUNTY	LAUREL, TOWN OF (100040)	19	$5,514,500	$16,258
SUSSEX COUNTY	LEWES, CITY OF (100041)	1,063	$313,746,500	$933,040
SUSSEX COUNTY	MILFORD, CITY OF (100042)	40	$13,302,500	$73,865
SUSSEX COUNTY	MILLSBORO, TOWN OF (100043)	86	$20,137,700	$47,923
SUSSEX COUNTY	MILLVILLE, TOWN OF (100044)	248	$70,244,000	$104,299
SUSSEX COUNTY	MILTON, TOWN OF (100045)	41	$13,488,000	$72,238
SUSSEX COUNTY	NEW CASTLE COUNTY * (105085)	1	$350,000	$1,930
SUSSEX COUNTY	OCEAN VIEW, TOWN OF (100046)	423	$129,209,400	$266,023
SUSSEX COUNTY	REHOBOTH BEACH, CITY OF (105086)	1,033	$282,009,400	$590,188
SUSSEX COUNTY	SEAFORD, CITY OF (100048)	23	$8,639,900	$19,374
SUSSEX COUNTY	SELBYVILLE, TOWN OF (100038)	39	$12,224,100	$46,102
SUSSEX COUNTY	SLAUGHTER BEACH, TOWN OF (100050)	115	$30,045,300	$210,262
SUSSEX COUNTY	SOUTH BETHANY, TOWN OF (100051)	840	$249,317,300	$797,570
SUSSEX COUNTY	SUSSEX COUNTY* (100029)	13,248	$3,657,865,800	$8,489,715
SUSSEX COUNTY	Unknown (Unknown)	812	$204,334,000	$545,299
Unknown	BETHANY BEACH, TOWN OF (105083)	9	$2,951,500	$21,017
Unknown	DEWEY BEACH, TOWN OF (100056)	10	$1,997,300	$6,211
Unknown	DOVER, CITY OF (100006)	1	$350,000	$467
Unknown	FENWICK ISLAND, TOWN OF (105084)	9	$2,705,500	$9,748
Unknown	HENLOPEN ACRES, TOWN OF (100053)	1	$250,000	$1,343

County	Community Name (Number)	Policies in Force	Total Coverage	Total Written Premium + FPF
Unknown	KENT COUNTY * (100001)	4	$1,119,000	$3,967
Unknown	LEWES, CITY OF (100041)	1	$350,000	$812
Unknown	NEW CASTLE COUNTY * (105085)	2	$279,500	$2,975
Unknown	OCEAN VIEW, TOWN OF (100046)	2	$700,000	$986
Unknown	REHOBOTH BEACH, CITY OF (105086)	36	$9,000,000	$10,455
Unknown	SOUTH BETHANY, TOWN OF (100051)	1	$350,000	$761
Unknown	SUSSEX COUNTY* (100029)	126	$31,126,800	$59,203
Unknown	Unknown (Unknown)	113	$24,340,000	$74,676
WORCESTER COUNTY	SUSSEX COUNTY* (100029)	4	$1,271,500	$2,896

Out of these policies, there were 44 claims made, totaling $833,051.[12]

State Programs

Along with national programs, like the NFIP, department-led state programs can increase the resiliency of Delaware. For example, Delaware's Preliminary Land Use Service (PLUS) provides state agency review of major land use change proposals prior to submission to local governments (Chapter 92 of Title 29 of the Delaware Code).

The PLUS process involves reviews by all applicable state agencies at the start of the land development process, adding value and knowledge to the process without taking over the authority of local governments to make land use decisions.

Land use change proposals are submitted to state agencies through the Office of State Planning Coordination and are the subject of monthly PLUS meetings at which applicants meet with state agency resource experts to discuss their plans and identify possible problems, and solutions.

Applicants are able to fully explain their projects to a group of planners representing all state agencies and to interact with those planners in a constructive dialogue. The streamlined process shortens state response time to more closely coordinate with local timelines. State comments are received in time to be of use and more completely reflect state and local land use plans and regulations.

DEMA specifically researches the land projects before the review meeting with the other state partners or stakeholders. The specific topics that DEMA researches are *Proposed Project Parcel Flood Concern*, which explains if the parcel would be in the Minimal Flood Concern of 1000 years or greater, 0.2% Flood Concern for 500 years, or 1% Flood Concern for 100 years.

The second topic of research is *Parcel Status within County Evacuation Zone Location,* explaining which evacuation zone the parcel is located in.

The third topic is, whether the parcel is or is not located *within the 10-mile Emergency Planning Zone (EPZ) for the Salem Nuclear Power Plant.*

The fourth topic includes *population* which is based on US 2010 and 2020 Census reports for the parcel(s).

[12] nfip_financial-losses-by-state_20220430.xlsx (live.com)

The fifth and final topic includes *FEMA National Risk Index.* According to FEMA's National Risk Index, the parcel(s) (**is or are**) considered **very low, relatively low, relatively moderate, relatively high, or extremely high** for overall natural hazards risks.

Expected Annual Loss
× Social Vulnerability
÷ Community Resilience
= Risk Index

More state programs are described in Delaware's Capability Assessment in **Section 5**.

4.5 Overall Vulnerability

At a minimum, the level of vulnerability remains the same in Delaware, though is impacted by the factors previously mentioned in Section 4.4.3. The most vulnerable state assets include:

- Socially vulnerable populations identified in Section 4.4.1.1
- Historical properties and structures over 50 years old
- Non-mitigated structures in the floodplains and coastal flood zone
- Coastal communities in general, but especially coastal development and tourism negatively impacted by coastal erosion
- Endangered and protected species

Because the entire state is a coastal zone due to its proximity to the ocean and its flat geography, Delaware's vulnerability to coastal hazards is significant and unavoidable.

Another concern is that a large event could quickly overwhelm the State's response capabilities and resources due to its small size.

The overall vulnerability level and priorities of the State remains the same since the 2018 State Hazard Mitigation Plan.

As climate change potentially increases the strength and number of disaster events, Delaware must remain aware of their vulnerabilities, mitigate potential risks as their capabilities allow, and strive to enhance their mitigation program in order to create a more resilient state.

4.6 Ranking

The natural hazards were ranked from Most Threatening to Least Threatening. Changes in development[13], the effects of climate change, and current data impacted the rankings. The following table reflects the change in ranking from the previous SHMP. Regardless of their ranking, all hazards are profiled equally and given the same amount of consideration when developing mitigation actions.

[13] *Changes in development* include conditions that may affect jurisdictions' risks from and vulnerabilities to hazards, such as changes in land use and development, including infrastructure development, declining populations, projected increases in population, or shifts in the needs of underserved communities or gaps in social equity.

Table 93: Natural Hazard Overall Significance Ranking

2018 Ranking	2018 Hazards	2023 Ranking	2023 Hazards
1	*Coastal Flooding*	**1**	Coastal Flooding
2	*Nor'easters & ET Storms*	**2**	Tropical Cyclones (hurricanes & tropical storms)
3	*Hurricanes & Tropical Storms*	**3**	Inland Flooding (riverine, flood, flash)
4	*Winter Precipitation (blizzard, freezing fog, frost/ freeze, heavy snow, ice storm, sleet, winter storm)*	**4**	Severe Winter Weather (blizzard, freezing fog, heavy snow, ice storm, sleet, winter storm)
5	*Coastal Erosion*	**5**	Coastal Erosion
6	*Inland Flooding*	**6**	Severe Thunderstorms & Tornadoes (heavy rains, high winds, strong winds, thunderstorm winds, hail, lightning)
7	*Severe Thunderstorms (heavy rains, high winds, strong winds, thunderstorm winds, hail, lightning)*	**7**	Extreme Temperatures (heat & cold)
8	*Extreme Heat*	**8**	Drought
9	*Extreme Cold frost/ freeze*	**9**	Dam/Levee Failure Flooding
10	*Tornadoes*	**10**	Wildfire & Smoldering Fires
Unranked	*Dam/Levee Failure*	**11**	Local earth movement (sinkholes & landslides)
Unranked	*Drought*	**12**	Earthquakes
Unranked	*Wildfire*		
Unranked	*Earthquakes*		
Unranked	*Tsunami*		
Unranked	*Sinkholes*		
Unranked	*Landslides*		

The non-natural hazards were not ranked, as their threats are too varied to compare. The State of Delaware will use equal levels of focus when mitigating hazards and will prioritize actions based on current situations and capabilities.

Section 5: State Mitigation Capabilities

The capability assessment is a critical part of the State's planning process. It helps Delaware identify and evaluate the resources that are in place, or need to be in place, to reduce risk and improve resilience. Capability assessment findings will help the State develop a stronger mitigation strategy based on a more realistic understanding of their ability to take action. Evaluating the effectiveness of hazard mitigation capabilities will help Delaware:

- Identify a framework for executing mitigation activities.
- Create a realistic mitigation strategy that has adequate resources.
- Identify needs for more program support to enhance capabilities or build capacity.

5.1 State of Delaware Capabilities

All State planning partners reviewed existing capabilities to determine whether they support, actively facilitates, or conflict with reducing risk.

5.1.1 Types of Capabilities

The four types of capabilities reviewed were:

1. **Planning and Regulatory:** state plans, policies, statutes or regulations that could affect your state's resilience to future natural hazard events and other future conditions, including the potential effects of climate change.
2. **Administrative and Technical:** staff, skills and tools that can reduce the risk of hazards in your state. These may be those of state agencies and departments, academic partners, regional planning, non-profit and private organizations.
3. **Financial:** potential funding resources to support hazard mitigation. These may be state funds and programs, FEMA or other federal programs, and private and non-profit resources.
4. **Education and Outreach:** existing programs that support mitigation and communicate risk. These could include technical assistance, training and education and awareness campaigns that build capacity.

The types of capabilities were reviewed and identified in the State's Capability Assessment. The full assessment can be found in **Appendix A**.

5.1.2 FEMA Flood Program Assessment

The administration of FEMA's NFIP; Community Rating System (CRS); and Risk Mapping, Assessment and Planning (Risk MAP) programs is a key component of community hazard mitigation capabilities.

The following questions were asked of the State NFIP Coordinator to assess the capabilities of Delaware's NFIP and Risk MAP flood programs.

5.1.2.1 National Flood Insurance Program (NFIP) And Community Rating System (CRS)

The NFIP provides flood insurance to property owners, renters and businesses, and having this coverage helps them recover faster when floodwaters recede. The NFIP works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects.

Flood insurance is available to anyone living in one of the 23,000 participating NFIP communities in the United States.

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. In CRS communities, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts. Flood insurance premium discounts in CRS communities range from 5% to 45% and are discounted in increments of 5%.

The State of Delaware published various floodplain and NFIP information on their public website, Floodplain Management - DNREC Alpha (delaware.gov).

Below is additional information regarding Delaware's participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS).

Which state agencies or departments administer the NFIP and CRS? How do these agencies or departments work together?

The Department of Natural Resources and Environmental Control (DNREC) is the state department that manages the Floodplain Management Program that is responsible for the administrational oversight of the NFIP. Specific tasks include: 1) Assisting local governments administer and enforce their Local Flood Damage Prevention Ordinances, 2) Conducting regular training programs in order to educate local floodplain administrators on floodplain management techniques, and 3) Providing technical and program oversight of the Flood Mitigation Assistance Program.

Do these agencies or departments have the right resources and staff in place to administer the programs effectively? If not, what are the opportunities to improve the capacity and capability?

The Floodplain Management Program has only one (1) engineer and two (2) grants, which is not enough to adequately administer the NFIP and CRS programs. To improve the department's capability, DNREC needs to hire additional staff. The same staffing action is needed at the local level to further improve local NFIP and CRS participation.

How does Delaware ensure compliance with minimum NFIP standards for state-owned properties?

As a home-rule state, Delaware relies on local government to enforce codes for all development. The State has not adopted a statewide floodplain ordinance for buildings, though they promote the use of freeboard in V and Coastal A Zones. *(Freeboard is the elevation of a building's lowest floor to a height above the minimum base flood elevation (BFE) during the initial construction process. Typical requirements call for an additional 1-3 ft. above BFE.)*

The National Flood Insurance Program requires structures built in V zones to be elevated so that the bottom of the lowest horizontal structure supporting the lowest floor is at or above BFE. To support this requirement, local ordinances have been enforced, such as the ones listed below.

Fenwick Island Commercial Zone[14]

Elevation requirements in Areas Other than Coastal High Hazard Areas and Coastal A Zones Nonresidential structures and nonresidential portions of mixed-use structures.

[14] *Delaware.gov*, https://fenwickisland.delaware.gov/files/2019/08/FIPS-Flood-Summary-081319.pdf. Accessed 3 Mar. 2023.

(1) The lowest floor (including basement) shall be elevated at least to the level of the base flood elevation plus 12 inches of freeboard or the structure shall be dry flood proofed in accordance with § 88-27B.

(2) In areas of shallow flooding (Zone AO), if not dry flood proofed, the lowest floor shall be elevated at least as high above the highest adjacent grade as the depth number specified in feet on the Flood Insurance Rate Map plus 12 inches of freeboard, or at least two feet plus 12 inches of freeboard if a depth number is not specified; adequate drainage paths shall be provided to guide floodwaters around and away from the structure.

(3) Enclosures below the lowest floor, if not dry flood proofed, shall meet the requirements of § 88-26B.

Elevation requirements in Coastal High Hazard Areas (Zone VE) and Coastal A Zones

(1) The bottom of the lowest horizontal structural member supporting the lowest floor (excluding the pilings, pile caps, columns, grade beams, and bracing) shall be located at least to the level of the base flood elevation plus 12 inches of freeboard.

(2) Basement floors that are below grade on all sides are prohibited.

(3) The space below the lowest floor shall either be free of obstruction or, if enclosed by walls, shall meet the requirements of § 88-31C. See FEMA Technical Bulletin No. 5, Free of Obstruction Requirements.

Ocean City LC-1

Minimum elevation requirements.

Notwithstanding the requirements of any other section of the Code or any lesser requirements of the Federal Emergency Management Agency, the elevation of the lowest floor of any building or structure within Ocean City, Maryland, shall be as follows:

Within 250’ of the dune line, a minimum of three feet above the base flood elevation as shown on the flood insurance rate map or if located in an X zone or other area without a mapped base flood elevation a minimum of three feet above the highest adjacent grade.

In an area east of Coastal Highway and greater than 250’ from the dune line a minimum of three feet above the base flood elevation or if located in an X zone or other area without a mapped base flood elevation, a minimum of two feet above highest adjacent grade.

In the area west of Coastal Highway, a minimum of two feet above the base flood elevation or if located in an X zone or other area without a mapped base flood elevation, a minimum of two feet above highest adjacent grade.

Bethany Beach C-1

Elevation requirements for Nonresidential structures and nonresidential portions of mixed-use structures.

The lowest floor shall be elevated to or above the base flood elevation plus 18 inches or the structure shall be dry floodproofed In areas of shallow flooding (Zone AO), if not dry flood proofed, the lowest floor shall be elevated at least as high above the highest adjacent grade as the depth number specified in feet on the Flood Insurance Rate Map plus 18 inches, or at least two feet plus 18 inches if a depth number is not specified; adequate drainage paths shall be provided to guide floodwaters around and away from the structure.

Enclosures below the lowest floor, if not dry flood proofed, shall be flood vented

Rehoboth Beach

Elevation requirements for Nonresidential structures and nonresidential portions of mixed-use structures.

The lowest floor shall be elevated to or above the base flood elevation plus one foot or the structure shall be dry flood proofed.

In areas of shallow flooding (Zone AO), if not dry flood proofed, the lowest floor shall be elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM plus one foot, or at least two feet plus one foot if a depth number is not specified. Structures are required to have adequate drainage paths around them on slopes, to guide floodwaters around and away from the structure.

Enclosures below the lowest floor, if not dry flood proofed, shall be flood vented.

How many communities participate in the NFIP? Are any communities not participating? Have any been suspended? If so, please describe.

The following table includes the NFIP status as of 08/01/2022 of the fifty (50) participating jurisdictions. Jurisdictions participating in the NFIP are required to regulate any development in designated flood prone areas.

Table 94: Communities Participating in the NFIP

CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date
100052D	ARDEN, VILLAGE OF	NEW CASTLE COUNTY	09/13/74	04/17/96	01/22/20	03/11/16
100058D	ARDENTOWN, VILLAGE OF	NEW CASTLE COUNTY		04/17/96	01/22/20	01/28/97
105083E	BETHANY BEACH, TOWN OF	SUSSEX COUNTY		04/06/73	03/16/15	04/06/73
100055E	BETHEL, TOWN OF	SUSSEX COUNTY	01/17/75	01/16/81	03/16/15	01/16/81
100031E	BLADES, TOWN OF	SUSSEX COUNTY	06/07/74	01/16/81	06/20/18	01/16/81
100002#	BOWERS, TOWN OF	KENT COUNTY	08/09/74	07/02/80	07/07/14	07/02/80
100032E	BRIDGEVILLE, TOWN OF	SUSSEX COUNTY	06/07/74	01/07/77	06/20/18	01/07/77
100003#	CAMDEN, TOWN OF	KENT COUNTY	05/24/74	09/16/81	07/07/14	09/16/81
100004#	CHESWOLD, TOWN OF	KENT COUNTY	08/09/74	01/07/77	07/07/14	01/07/77
100005#	CLAYTON, TOWN OF	KENT COUNTY	05/17/74	06/01/77	07/07/14	06/01/77
100033E	DAGSBORO, TOWN OF	SUSSEX COUNTY	06/28/74	06/01/81	03/16/15	06/01/81
100022D	DELAWARE CITY, CITY OF	NEW CASTLE COUNTY	04/05/74	02/16/77	02/04/15	02/16/77
100059E	DELMAR, TOWN OF	SUSSEX COUNTY		06/16/95	06/20/18	02/28/07
100056E	DEWEY BEACH, TOWN OF	SUSSEX COUNTY	12/13/74	10/06/76	03/16/15	06/18/82
100006#	DOVER, CITY OF	KENT COUNTY	05/31/74	09/16/82	07/07/14	09/16/82
100060#	ELLENDALE, TOWN OF	SUSSEX COUNTY		06/16/95	(NSFHA)	04/19/11
100023D	ELSMERE, TOWN OF	NEW CASTLE COUNTY	06/05/70	12/31/76	01/22/20	12/31/76
100008#	FELTON, TOWN OF	KENT COUNTY	08/09/74	01/07/77	07/07/14	01/07/77
105084E	FENWICK ISLAND, TOWN OF	SUSSEX COUNTY		03/23/73	03/16/15	03/23/73
100037E	FRANKFORD, TOWN OF	SUSSEX COUNTY	06/07/74	09/16/81	03/16/15	09/16/81
100009#	FREDERICA, TOWN OF	KENT COUNTY	05/17/74	01/02/81	07/07/14	01/02/81
100062E	GEORGETOWN, TOWN OF	SUSSEX COUNTY		06/16/95	06/20/18	05/05/03
100039E	GREENWOOD, TOWN OF	SUSSEX COUNTY	05/24/74	02/24/78	03/16/15	02/24/78
100010C	HARRINGTON, CITY OF	KENT COUNTY	05/17/74	06/01/77	06/20/18	06/01/77

CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date
100053E	HENLOPEN ACRES, TOWN OF	SUSSEX COUNTY	09/06/74	08/15/78	03/16/15	08/15/78
100001C	KENT COUNTY *	KENT COUNTY	06/27/75	03/15/78	06/20/18	03/15/78
100040E	LAUREL, TOWN OF	SUSSEX COUNTY	06/07/74	01/16/81	06/20/18	01/16/81
100014#	LEIPSIC, TOWN OF	KENT COUNTY	08/09/74	09/29/78	07/07/14	09/29/78
100041E	LEWES, CITY OF	SUSSEX COUNTY	06/07/74	03/15/77	03/16/15	03/15/77
100015#	LITTLE CREEK, TOWN OF	KENT COUNTY	08/09/74	01/17/79	07/07/14	01/17/79
100065#	MAGNOLIA, TOWN OF	KENT COUNTY		05/05/03	(NSFHA)	04/05/18
100024D	MIDDLETOWN, TOWN OF	NEW CASTLE COUNTY	08/02/74	01/07/77	01/22/20	01/07/77
100042E	MILFORD, CITY OF	SUSSEX COUNTY/KENT COUNTY	05/24/74	06/01/77	03/16/15	06/01/77
100043E	MILLSBORO, TOWN OF	SUSSEX COUNTY	06/21/74	09/01/78	06/20/18	09/01/78
100044E	MILLVILLE, TOWN OF	SUSSEX COUNTY	10/18/74	09/25/81	03/16/15	09/25/81
100045E	MILTON, TOWN OF	SUSSEX COUNTY	09/13/74	08/01/78	03/16/15	08/01/78
105085D	NEW CASTLE COUNTY *	NEW CASTLE COUNTY		12/03/71	01/22/20	12/03/71
100026D	NEW CASTLE, CITY OF	NEW CASTLE COUNTY	12/07/73	12/26/75	01/22/20	12/26/75
100025D	NEWARK,CITY OF	NEW CASTLE COUNTY	06/05/70	12/07/71	01/22/20	03/29/74
100046E	OCEAN VIEW, TOWN OF	SUSSEX COUNTY	08/02/74	09/03/80	03/07/17	09/03/80
100066D	ODESSA, TOWN OF	NEW CASTLE COUNTY	01/31/75	04/17/96	02/04/15	04/27/12
105086E	REHOBOTH BEACH, CITY OF	SUSSEX COUNTY		03/30/73	03/16/15	03/30/73
100048E	SEAFORD, CITY OF	SUSSEX COUNTY	06/21/74	02/01/79	06/20/18	02/01/79
100038E	SELBYVILLE, TOWN OF	SUSSEX COUNTY		07/16/91	03/16/15	07/16/91
100050E	SLAUGHTER BEACH, TOWN OF	SUSSEX COUNTY	11/15/74	07/02/80	03/16/15	07/02/80
100017#	SMYRNA, TOWN OF	KENT COUNTY	05/10/74	06/01/77	07/07/14	06/01/77
100051E	SOUTH BETHANY, TOWN OF	SUSSEX COUNTY	05/31/74	10/06/76	03/07/17	10/06/76
100029E	SUSSEX COUNTY*	SUSSEX COUNTY	12/13/74	10/06/76	06/20/18	10/06/76
100028D	WILMINGTON, CITY OF	NEW CASTLE COUNTY	05/31/74	05/02/77	01/22/20	05/02/77
100020#	WYOMING, TOWN OF	KENT COUNTY	05/24/74	03/16/81	05/05/03	03/16/81

Source: NFIP Community Status Book

The following table includes five (5) jurisdictions not participating in the NFIP as of 08/01/2022.

Table 95: NFIP Non-Participants

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Sanction Date
100057D	ARDENCROFT, VILLAGE OF	NEW CASTLE COUNTY		04/17/96	01/22/20	04/17/97
100021D	BELLEFONTE, TOWN OF	NEW CASTLE COUNTY		04/17/96	01/22/20	04/17/97
100054D	NEWPORT, TOWN OF	NEW CASTLE COUNTY	12/20/74	06/15/78	01/22/20	02/05/15(S)
100068D	TOWNSEND, TOWN OF	NEW CASTLE COUNTY		04/17/96	01/22/20	04/17/97

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Sanction Date
100070#	WOODSIDE, TOWN OF	KENT COUNTY		05/05/03	07/07/14	05/05/04

Source: NFIP Community Status Book

To date, there have been no communities suspended in the NFIP Program.

How many NFIP communities are CRS communities?

As of 08/01/2022, there are eleven (11) CRS communities in the State of Delaware. These communities are recognized in the following table.

Table 96: CRS Communities

CID	Community Name	County	CRS Entry Date	Curr Eff Date	Curr Class	% Disc SFHA	% Disc Non SFHA
105083E	BETHANY BEACH, TOWN OF	SUSSEX COUNTY	05/01/09	05/01/09	8	10%	05%
100022D	DELAWARE CITY, CITY OF	NEW CASTLE COUNTY	10/01/12	10/01/12	8	10%	05%
100056E	DEWEY BEACH, TOWN OF	SUSSEX COUNTY	10/01/94	04/01/22	9	05%	05%
105084E	FENWICK ISLAND, TOWN OF	SUSSEX COUNTY	10/01/94	04/01/22	9	05%	05%
100041E	LEWES, CITY OF	SUSSEX COUNTY	10/01/92	04/01/21	8	10%	05%
105085D	NEW CASTLE COUNTY *	NEW CASTLE COUNTY	05/01/13	05/01/19	6	20%	10%
100026D	NEW CASTLE, CITY OF	NEW CASTLE COUNTY	10/01/94	10/01/99	8	10%	05%
100025D	NEWARK, CITY OF	NEW CASTLE COUNTY	10/01/92	10/01/01	7	15%	05%
105086E	REHOBOTH BEACH, CITY OF	SUSSEX COUNTY	10/01/94	10/01/95	8	10%	05%
100048E	SEAFORD, CITY OF	SUSSEX COUNTY	10/01/96	10/01/96	9	05%	05%
100051E	SOUTH BETHANY, TOWN OF	SUSSEX COUNTY	10/01/07	10/01/07	8	10%	05%

Source: NFIP Community Status Book

Have communities' NFIP participation or insurance coverage changed? Has the number or class of any CRS communities changed since the last plan update? If so, please describe.

There has been no change in NFIP participation or the number of CRS communities since the last plan.

Insurance coverage has remained the same, though premium changes have occurred. As of Oct. 1. 2021, FEMA fundamentally changed the way it rates a property's flood risk and prices insurance for the more than five million NFIP policyholders. Known as Risk Rating 2.0, this new methodology incorporates more flood risk data variables to more accurately reflect a property's individual flood risk. The following table and figure shows the FEMA Risk Rating 2.0 projected premium changes in Delaware for 2021. Overall, the total percent of policies with decreased premiums in Delaware was 37.7%.[15]

Table 97: Projected First-YR Premium Changes

Delaware	All Policies	<5 Policies*	Unkn. Zip*

[15] Projected policy changes can be viewed at State Totals: Projected Risk Rating 2.0 Premium Changes - All NFIP & SFH Policies (arcgis.com).

	Decreased:	9,845	37.7%	3	37.5%	31	56.4%
	Incr. $0-$10:	13,538	51.8%	4	50.0%	24	43.6%
	Incr. $10-$20:	2,190	8.4%	1	12.5%	0	0.0%
	Incr. $20+:	574	2.2%	0	0.0%	0	0.0%
	Total:	**26,147**		**8**		**55**	

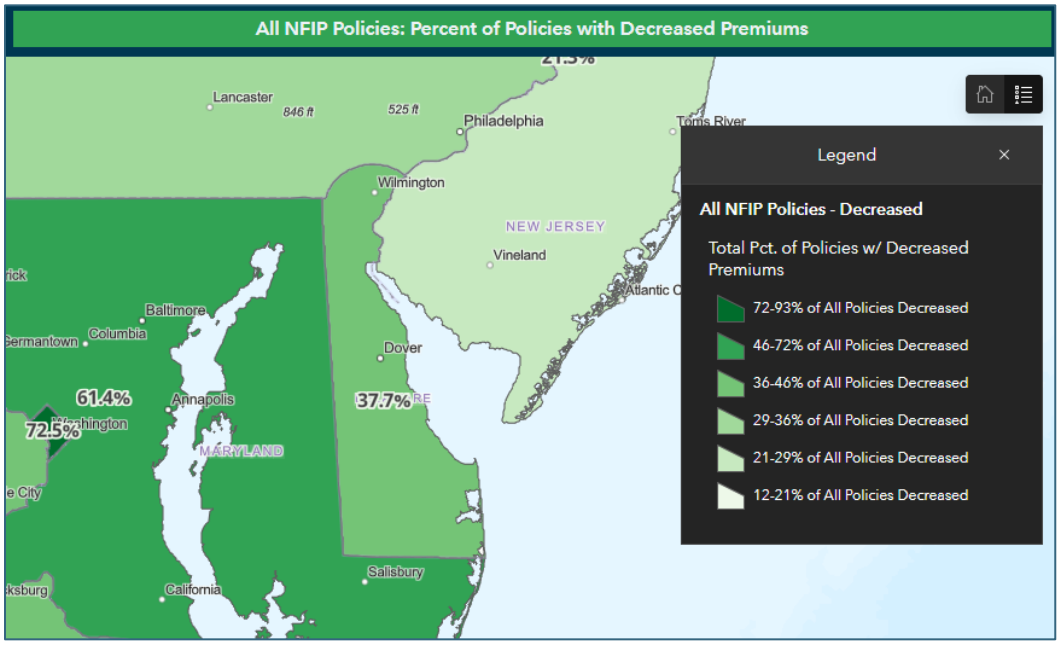

Figure 54: Percent of Polices with Decreased Premiums

Risk Rating 2.0 is equity in action. With Risk Rating 2.0, individuals will no longer pay more than their share in flood insurance premiums based on the value of their homes. Roughly two-thirds of policyholders with older pre-FIRM homes will see a premium decrease.

FEMA will reduce disaster-related suffering and disaster-related costs in Delaware through insurance and the mitigation of flood risks by leveraging advances in industry best practices, technology, and flood risk modeling.

FEMA's core mission and programs continue to emphasize purchasing flood insurance and pursuing mitigation options to achieve resiliency. While there are many policies in force in Delaware, there are still opportunities to increase participation in the program to improve resilience, as shown in the following figure.

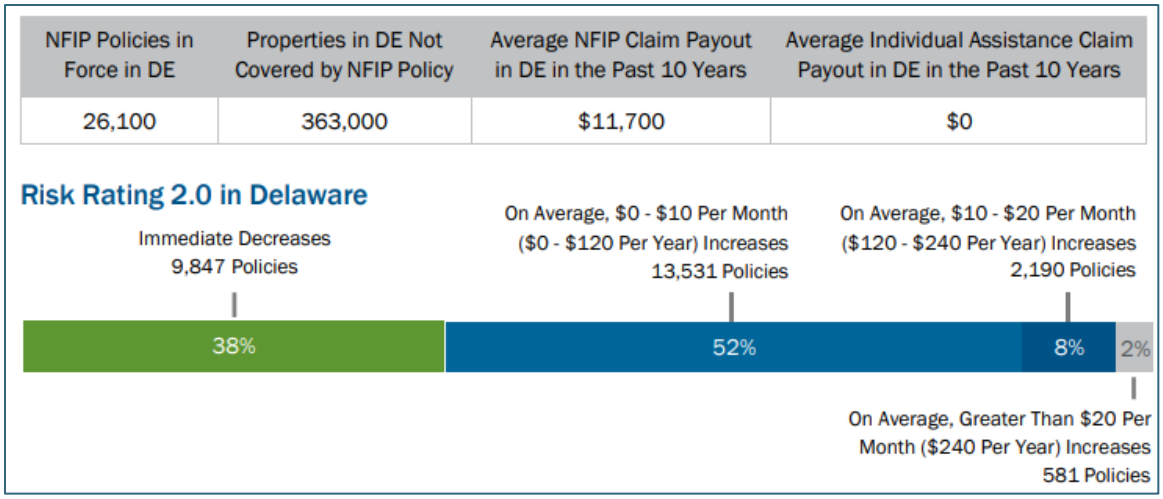

Figure 55: Delaware 2021 NFIP Insurance Policies

How does Delaware help communities that participate or have an interest in the NFIP or CRS? This could include providing training, technical assistance or data.

To help communities that participate or have an interest in the NFIP or CRS, Delaware provides various, free trainings and workshops (i.e. E-273), both State and FEMA- instructed. The Delaware Flood Planning Tool provides local flood data and modeling and access to previous letters of map changes. DNREC also provides technical assistance.

The Delaware Homeowner's Handbook to Prepare for Natural Hazards describes actions that homeowners can take to protect their properties from flooding.

The Delaware Silver Jackets is an interagency collaboration that allows for greater facilitation and communication regarding flood risk identification, risk communication, flood hazard mitigation, the promotion of sound floodplain management practices, and addressing other natural hazards that threaten Delaware.

Also, DNREC publishes an occasional newsletter, the First State Watermark, to share information and updates with local governments, floodplain managers, and the public.

Does Delaware use Community Assistance Visits (CAVs) or Community Assistance Contacts (CACs) to support local communities? *(CAVs and CACs are two ways FEMA and state agencies (acting on behalf of FEMA) can identify challenges in a community's floodplain management program. They can also be used to provide technical assistance to resolve these issues. They are a key part of making sure communities meet the requirements of the NFIP.)*

DNREC conducts roughly four (4) Community Assistance Visits (CAVs) and four (4) Community Assistance Contacts (CACs) a year to support local communities. They review the permitting of floodplain developments over the past five (5) years.

Does Delaware offer a model floodplain ordinance to local jurisdictions? If so, please describe.

Various models and examples of floodplain ordinances are available to local jurisdictions. The DNREC Floodplain Management Program assists local NFIP participating communities by providing guidance for

the development, maintenance and administration of floodplain ordinances that comply with National Flood Insurance Program requirements set forth in 44 CFR 60.3.

Model flood ordinances have been developed by DNREC for both coastal and non-coastal communities and are based on the types of flood hazard faced by a community. These model ordinances meet the minimum standard requirements of the NFIP but also incorporate language from the recommendations of the Delaware Floodplain and Drainage Advisory Committee created through Senate Bill 64. There are models for communities wanting to adopt higher floodplain standards, which can reduce flood damage and lower flood insurance premiums.

Communities with only Zones AE, AO and/or A

- Basic Zone A Version with Notes and Instructions
- Basic Compared to SB64 – Zone A Version
- SB 64 Zone A Version with Notes and Instructions

Communities with both Zones AE and VE

- Basic Zone AE and Zone VE Version with Notes and Instructions
- Basic Compared to SB64 – Zone AE and VE Version
- SB 64 Zone AE and Zone VE Version with Notes and Instructions

Does Delaware incorporate higher standards into state laws/regulations, such as state building code requirements? If so, please describe.

While it promotes adoption of higher standards, Delaware is very limited in its capability to create and enforce state laws and regulations due to it being a home-rule state. Local government has the most influence on incorporating higher standards within their jurisdictions. The only statewide regulation is the requirement of freeboard as mandated by Executive Order. DNREC's statewide floodplain management activities include:

1. Technical and planning assistance with NFIP regulations for floodplain development, assistance with the Community Rating System (CRS) program, and hazard mitigation grant assistance.
2. Monitoring the performance of local community floodplain management and review of locally adopted floodplain ordinances to ensure compliance with the NFIP through periodic Community Assistance Visits (CAV) and Community Assistance Contacts (CAC).
3. Educational outreach and training events.
4. Updates and improvement to FIRMs.
5. Participation in the state hazard mitigation planning process.
6. Consultation to state agencies for state-owned facilities in special flood hazard areas.
7. Partnerships with local, state and federal organizations.

How does Delaware support communities who administer SI/SD (Substantial Improvement/Substantial Damage)? This could include training, how the state monitors performance, and how it works with communities after a disaster. *(SD administration is a crucial post-disaster capability under the NFIP. It refers to how the community and FEMA assess building damages after a disaster. It determines what is needed to repair a structure. Under the NFIP, when the cost to repair or improve a structure is at or over 50% of the structure's pre-damage market value, the structure must be brought to comply with current NFIP standards, building codes and other standards.)*

To support communities who administer SI/SD, DEMA & DNREC make sure communities have checklists to easily follow and track progress. DEMA does boots-on-the-ground damage assessments for any property damage in a floodplain. The State of Delaware has prepared a Substantial

Improvement/Substantial Damage Guidance document to help communities and property owners in recovering from events which cause damage to structures in the floodplain.

What structures are at high risk of flooding, including repetitive and severe repetitive loss structures?

Structures within the 100-yr and 500-yr floodplain that are not already mitigated via elevation are at a high risk of flooding. As of January 1, 2023, there are 450 repetitive loss (RL) properties and 112 severe repetitive loss (SRL) properties on record in Delaware. That's an increase of 80 RL properties since 2018 and decrease of 30 SRL properties since 2018.

Table 98: RL/SRL Properties by County

Jurisdiction	*2018 Repetitive Loss*	2023 Repetitive Loss	*2018 Severe Repetitive Loss*	2023 Severe Repetitive Loss	*2018 Total*	2023 Total
Kent County Total	***33***	**40**	***12***	**11**	***45***	**51**
Bowers	*6*	9	*2*	2	*8*	11
Dover	*2*	1			*2*	1
Little Creek	*1*	1			*1*	1
Milford	*4*	8	*3*	2	*7*	10
Smyrna		1	*1*	1	*1*	2
Other	*20*	20	*6*	6	*26*	26
New Castle County Total	***115***	**129**	***52***	**49**	***167***	**178**
Delaware City	*2*	2			*2*	2
Elsmere	*1*	3	*2*	1	*3*	4
New Castle (City)	*2*	3			*2*	3
Newark	*3*	7	*2*	2	*5*	9
Wilmington	*11*	18	*4*	2	*15*	20
Other	*96*	96	*44*	44	*140*	140
Sussex County Total	***222***	**281**	***78***	**52**	***300***	**333**
Bethany Beach	*40*	52	*9*	2	*49*	54
Dewey Beach	*14*	33	*12*	5	*26*	38
Fenwick Island	*14*	17	*1*	1	*15*	18
Lewes	*15*	16			*15*	16
Millsboro	*1*	1			*1*	1
Milton		1	*1*	1	*1*	2
Ocean View	*1*	1			*1*	1
Rehoboth Beach	*2*	9	*3*	1	*5*	10
Slaughter Beach	*1*	1			*1*	1
South Bethany	*29*	45	*12*	2	*41*	47
Other	*105*	105	*40*	40	*145*	145

Does Delaware coordinate with the Association of State Floodplain Managers? If so, please describe.

Delaware's State NFIP Coordinator is a Certified Floodplain Manager (CFM) and an active member of the Association of State Floodplain Managers. The Coordinator participates in general meetings and quarterly reporting and shares informational & educational material.

What are some obstacles, challenges and proposed solutions related to the NFIP and CRS program?

While lack of staffing is always a challenge in adequately administering the NFIP and CRS programs, the number of requirements to be a CRS community is overwhelming. To participate in the CRS, a community must:

- Be in the Regular Phase of the NFIP for at least one year;
- Be in full compliance with the minimum requirements of the NFIP. This is documented by a "letter of full compliance" from the FEMA Regional Office;
- Keep Elevation Certificates, Flood Insurance Rate Maps, and Flood Insurance Studies for as long as the community is in the CRS;
- Maintain flood insurance on all buildings owned by the community that are required to have flood insurance; - Designate a CRS Coordinator;
- Cooperate with the ISO/CRS Specialist and the verification procedures;
- Submit a recertification each year attesting that all credited activities are still being implemented;
- Track the area of the regulated floodplain and the number of buildings in the regulated floodplain each year; and
- Maintain other records of activities until they are reviewed at the next verification visit.

Many local jurisdictions express the feeling that meeting these requirements does not provide additional benefits to the community and only increase their overhead costs. Financial incentives for the administration of the CRS program could help tackle this challenge.

Another obstacle is requiring local floodplain coordinators to be certified floodplain managers or at least participate in NFIP trainings. Many local coordinators fulfill the role as an additional duty and are not fully qualified for the position. State regulation and additional funding and professional development opportunities could help local coordinators become certified.

Have your NFIP and CRS program capabilities changed since the last plan update?

Since the last plan update, there has been more promotion of the NFIP program, including a bus campaign and promoting National Flood Awareness Week.

5.1.2.2 Risk Mapping, Assessment, and Planning (Risk MAP)

Risk MAP supports community resilience by providing data, building partnerships, and supporting long-term hazard mitigation planning. In particular, Risk MAP's Flood Risk Products work alongside regulatory products to provide flood risk information and support your community's overall floodplain management and hazard mitigation strategies.

Below is additional information regarding Delaware's participation in Risk MAP program.

Which state agencies or departments participate in the Risk MAP program? How do they work together and with FEMA?

The Department of Natural Resources and Environmental Control (DNREC) is the state department that participates in the Risk MAP program. They implement the CTP Program, have flood maps reviewed by an engineer, and analyze FEMA data to update Delaware's Flood Planning Tool. The Tool is used to identify hazard-prone areas affected by sea level rise. DNREC's Floodplain Management Program works with FEMA to improve the accuracy of Flood Insurance Rate Maps.

Do these agencies and departments have the right resources and staff to participate in the program effectively? If not, what are the opportunities to improve capacity and capability?

Many Risk MAP services are contracted out to private companies while DNREC grows grow their NFIP division with qualified individuals.

Does Delaware use flood hazard mapping programs: CTP Program, Floodplain Management and CAP-SSSE? *(The CTP program offers partners funding to support flood hazard mapping projects, community outreach and related mitigation tasks.)*

Delaware uses the CTP Program, Floodplain Management, and CAP-SSSE.

How does Delaware share data and information to support the creation of Risk MAP products?

DNREC shares flood data and information via the Flood Mapping Tool and FirstState.

How does Delaware encourage the use of Risk MAP products in local HMPs? *(This builds the capabilities of local communities to communicate risk.)*

Delaware encourages the use of Risk MAP products in local HMPs by constantly conducting public outreach in the form of conferences and training workshops; the Flood Mapping Tool; and utilizing the University of Delaware's *Flood Ready Communities Program.*

How does Delaware teach people about statewide flood risk through Risk MAP?

As with the local HMPs, Delaware teaches people about statewide flood risk through Risk MAP by constantly conducting public outreach in the form of conferences and training workshops; the Flood Mapping Tool; and utilizing the University of Delaware's *Flood Ready Communities Program*.

Does Delaware have any active mapping update projects? If so, where?

Mapping update projects are handled by the FEMA Cooperating Technical Partners (CTP) Program.

How does Delaware identify areas that need to be studied or restudied for flood risk?

Delaware's site assessment process involves engineers reviewing floodplain maps prior to new construction/developments.

Does Delaware use Risk MAP as an opportunity to build partnerships with communities or state and federal agencies, or others? If so, how?

Delaware uses Risk MAP as an opportunity to build partnerships with communities or state and federal agencies in the form of conferences, public outreach, and FEMA-led events.

What are some obstacles, challenges and proposed solutions related to the state's flood hazard mapping program capabilities?

The greatest challenge to Delaware's flood hazard mapping program capabilities is lack of staffing.

Have the flood hazard mapping program capabilities changed since the last plan update?

Since the last plan update, there has been more coastal mapping via drones for beach nourishment projects.

5.2 State of Delaware Planning Laws

Since 2002, the American Planning Association (APA) has periodically surveyed planning enabling laws in all 50 states. The first survey, conducted under the auspices of the Growing Smart Legislative Guidebook project, served as a benchmark for subsequent efforts.

With support from the Federal Emergency Management Agency's Cooperating Technical Partners program, APA researchers completed the latest survey in the summer of 2022.

This story map summarizes key themes that emerged from the 2022 survey and includes a series of interactive maps that allow users to view details for each state. The first section explores core land-use planning laws that, collectively, provide insight into the overall strength of each state's role in comprehensive planning. The next two sections examine key laws that affect hazard mitigation and climate action planning, respectively. The final thematic section proposes an aggregate combined resilience score, based on the previous themes. The full survey can be found at 2022 Survey of State Planning Laws (arcgis.com).

5.2.1 Strength of State Role

Every state has laws that enable or require local comprehensive planning activities. Some states play a strong role in shaping these activities, while others leave almost all decisions about when and how to plan up to local officials.

Table 99: Strength of State Role

Criteria	Yes/No
Statutes require a climate action element in a state-level comprehensive or land-use plan.	No
Statutes include state goals for comprehensive planning that address climate action.	No
Statutes require or suggest an element that addresses climate change mitigation for the comprehensive plans of most general-purpose local jurisdictions.	No
Statutes require or suggest an element that addresses climate change adaptation for the comprehensive plans of most general-purpose local jurisdictions.	No
Statutes require or suggest a dedicated climate action element for the comprehensive plans of most general-purpose local jurisdictions.	No

This map divides all states into high-, medium-, and low-strength categories, based on the set of criteria displayed in the table above. APA researchers classified states with laws that meet five to eight criteria as having a high-strength role in planning, those with laws that meet one to four criteria as having a medium-strength role, and those with laws that meet zero criteria as having a low-strength role.

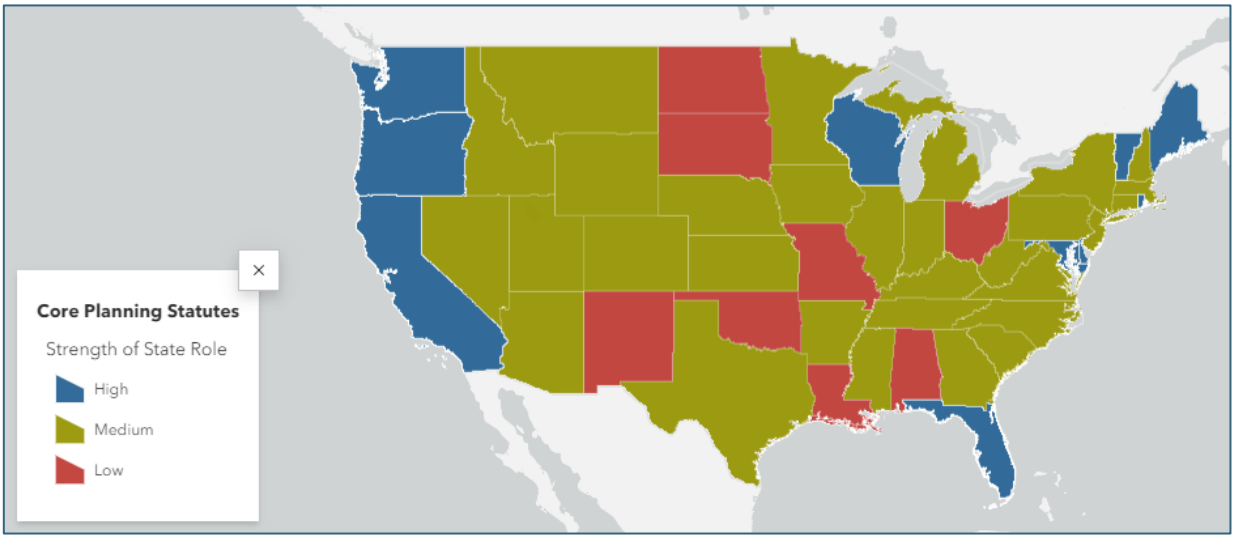

Figure 56: Strength of State Role, State Comparison

Delaware is one of eleven states have statutes that include guidelines for a statewide comprehensive or land-use plan or a state-level comprehensive or land-use plan that applies to a large subarea of the state. For some states, these statutes pertain to a one-time plan, while for others, the statutes apply to a plan that must be updated periodically.

The state statutes do not include state goals for comprehensive planning but it does include guidelines for a state land-use plan in Code 9101(c)(1).

Delaware is one of thirty-two states that have statutes that require the local legislative body of most general-purpose local jurisdictions to adopt comprehensive plans. In other states, statutes identify the local planning commission as the default adoptive authority or do not explicitly address adoption.

Additionally, Delaware is one of twenty-one states have statutes that require the zoning regulations of most general-purpose local jurisdictions to be consistent with the jurisdiction's adopted comprehensive plan. Statutes in most other states retain the Standard State Zoning Enabling Act's language that local jurisdictions must formulate zoning "in accordance with" a comprehensive plan, without explicitly requiring consistency between these two, separate documents.

5.2.2 Emphasis on Hazard Mitigation

State laws that establish the framework for local planning activities and development regulations can complement or supplement federal statutes and regulations that guide most state and local hazard mitigation planning efforts. Through these laws, some states place a high emphasis on hazard mitigation, while others offer less explicit or extensive guidance for hazard mitigation planning initiatives.

Table 100: Hazard Mitigation Emphasis

Criteria	Yes/No
Statutes require a hazard mitigation element in a state-level comprehensive or land-use plan.	No

Criteria	Yes/No
Statutes include state goals for comprehensive planning that address hazard mitigation.	No
Statutes require or suggest an element that addresses hazards planning for the comprehensive plans of most general-purpose local jurisdictions.	No
Statutes describing a hazards-related comprehensive plan element reference specific hazards.	No
Statutes require or suggest a dedicated hazards planning element for the comprehensive plans of most general-purpose local jurisdictions	No
Statutes require or suggest an element that addresses planning for post-disaster recovery for the comprehensive plans of most general-purpose local jurisdictions.	No
Statutes require or suggest one or more standalone hazards-related plans for most general-purpose local jurisdictions.	No
Statutes require or suggest integration or alignment of the local comprehensive plan and standalone local hazards-related plans for most general-purpose local jurisdictions.	No
Statutes require or suggest compliance with NFIP requirements for the local floodplain regulations of most general-purpose local jurisdictions.	Yes
Statutes adopt a version of the international code council's international building code as a uniform, minimum, or default standard.	No
Statutes adopt a version of the international code council's international residential code as a uniform, minimum, or default standard.	No
Statutes adopt a version of the international code council's international existing building code as a uniform, minimum, or default standard.	No
Statutes adopt a version of the international code council's international wildland-urban interface code as a uniform, minimum, or default standard.	No

This map divides all states into high-, medium-, and low-strength categories, based on the set of criteria displayed in the table above. APA researchers classified states with laws that meet eight to 13 criteria as having a high emphasis on hazard mitigation, those with laws that meet one to seven criteria as having a medium emphasis on hazard mitigation, and those with laws that meet zero criteria as having a low emphasis on hazard mitigation.

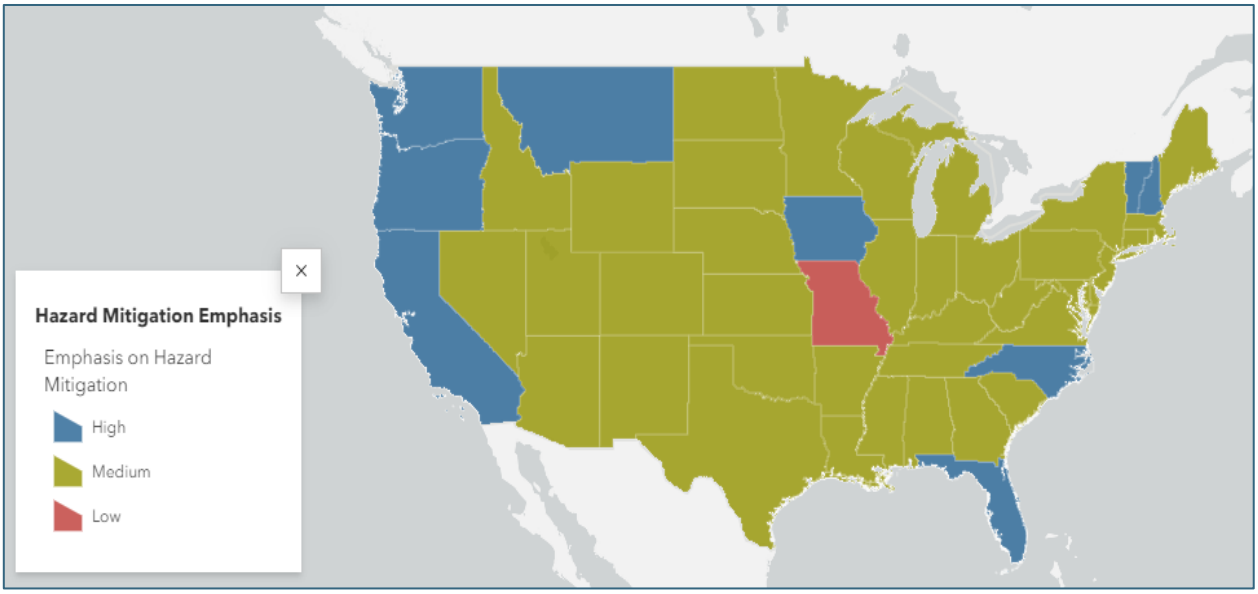

Figure 57: Hazard Mitigation Emphasis, State Comparison

Delaware is one of twenty-seven states that have statutes that require or suggest compliance with National Flood Insurance Program (NFIP) requirements for local floodplain regulation of most general-purpose local jurisdictions.

Forty-four states have statutes that adopt a version of the International Code Council's International Building Code (IBC) as a uniform, minimum, or default standard, but Delaware is not one of them. Uniform-standard states impose the same code statewide with no (or limited) exceptions. Minimum-standard states establish a statewide code as a baseline but permit local jurisdictions to adopt stricter standards. Default-standard states adopt a code as a suggested, but not mandatory, baseline for local building codes.

Along with building codes, Delaware is also not one of the thirty-nine states have statutes that adopt a version of the International Code Council's International Residential Code (IRC) as a uniform, minimum, or default standard. Uniform-standard states impose the same code statewide with no (or limited) exceptions. Minimum-standard states establish a statewide code as a baseline but permit local jurisdictions to adopt stricter standards. Default-standard states adopt a code as a suggested, but not mandatory, baseline for local building codes.

5.2.3 Emphasis on Climate Action

While not yet common, some states include references to climate change mitigation or adaptation planning activities in laws that establish the framework for local planning. Through these laws, some states place a high emphasis on climate action, while others offer less explicit or extensive guidance for climate action planning initiatives.

Table 101: Climate Action Statutes

Criteria	Yes/No
Statutes include guidelines for a state-level comprehensive or land-use plan.	Yes
Statutes include state goals for comprehensive planning.	No
Statutes require most general-purpose local jurisdictions to prepare and adopt comprehensive plans.	No

Criteria	Yes/No
Statutes require the legislative body of most general-purpose local jurisdictions to adopt comprehensive plans.	Yes
Statutes require zoning regulations of most general-purpose local jurisdictions to be consistent with the jurisdiction's adopted comprehensive plan.	Yes
Statutes require the comprehensive plans of most general-purpose local jurisdictions to be consistent with one or more state or regional plans.	Yes
Statutes require the comprehensive plans of most general-purpose local jurisdictions to be consistent with the plans of neighboring or nearby local jurisdictions.	Yes
Statutes require the comprehensive plans of most general-purpose local jurisdictions to include specific elements.	Yes

This map divides all states into high-, medium-, and low-strength categories, based on the set of criteria displayed in the table above.

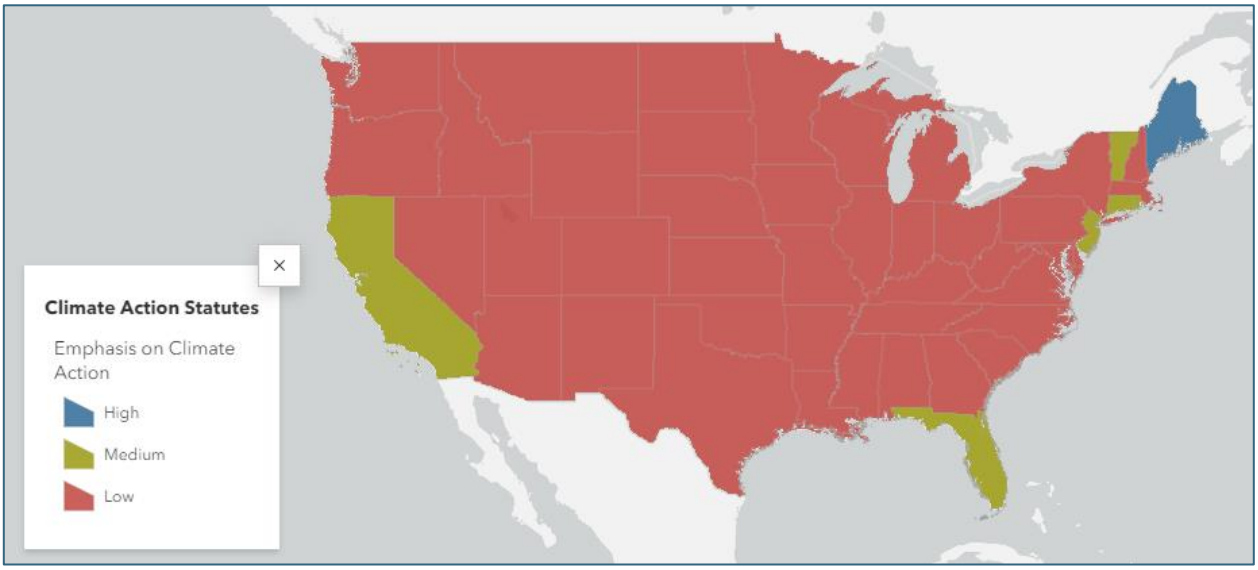

Figure 58: Climate Action Statutes, State Comparison

APA researchers classified states with laws that meet three to five criteria as having a high emphasis on climate action, those with laws that meet one to two criteria as having a medium emphasis on climate action, and those with laws that meet zero criteria as having a low emphasis on climate action.

As shown in the map, most states do not have statutes that require a climate action element in a state-level comprehensive or land-use plan, include state goals for comprehensive planning that address climate action, require or suggest an element that addresses climate change mitigation for the comprehensive plan of most general-purpose local jurisdictions, require or suggest an element that addresses climate change mitigation for the comprehensive plan of most general-purpose local jurisdictions, or require or suggest a dedicated climate action element for the comprehensive plan of most general-purpose local jurisdictions.

5.2.4 Capability Summary

Collectively, the statutory characteristics highlighted in previous sections may indicate the degree to which states are promoting community resilience through laws that establish the framework for local planning activities.

This map divides all states into high-, medium-, and low-resilience planning categories, based on each state's aggregate score for the strength of the state role in planning, emphasis on hazard mitigation, and emphasis on climate action. APA researchers classified states with laws that meet 15 to 26 criteria as having a high resilience planning score, those with laws that meet seven to 14 criteria as having a medium resilience planning score, and those with laws that meet less than seven criteria as having a low resilience planning score.

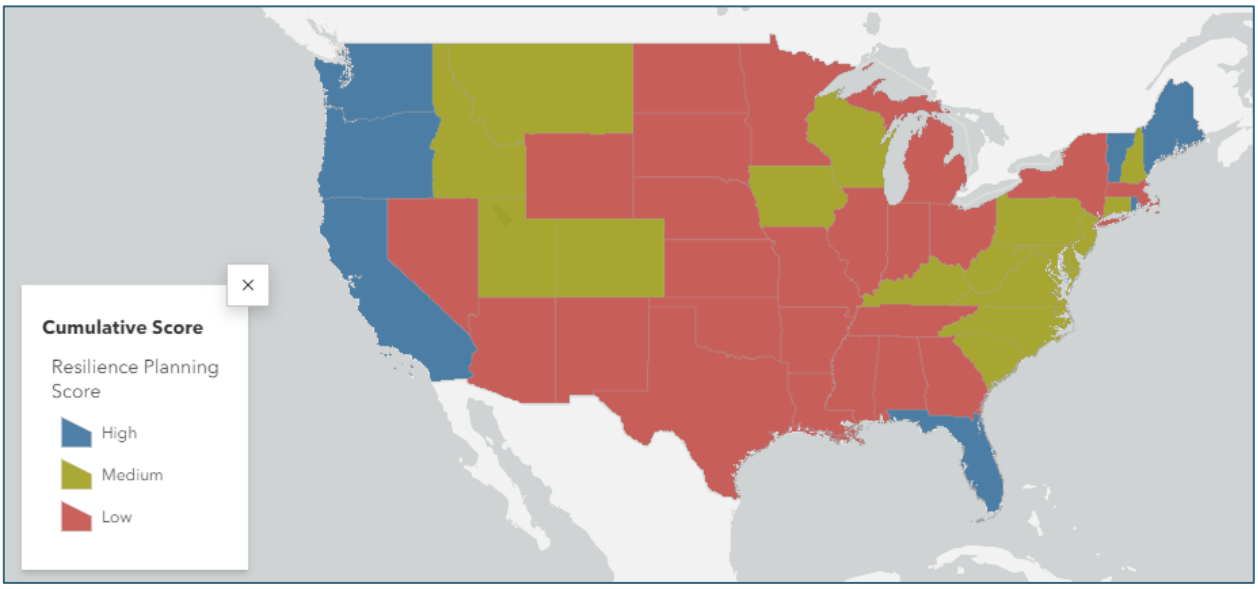

Figure 59: Resilience Planning Score, State Comparison

Planning remains, primarily, a local function across the U.S. Consequently, the state laws that establish the framework for local planning activities matter. While all states broadly enable local planning, there are dramatic differences among states in terms of the scope and breadth of statutes guiding these activities. Furthermore, few states have updated their laws in response to the growing threats posed by a changing climate and increasingly frequent and severe natural disasters. While state planning-enabling laws, overall, look quite different than their 1920s models, there is still considerable room for improvement when it comes to promoting community resilience through planning.

Delaware, specifically, scored Medium on the Resilience Planning Score. Major disasters can quickly overwhelm local and state resources and capabilities. With local governments having control of building codes and more influence on regulations, the State has a goal of working with its local governments on growing the overall mitigation capabilities of all. One method is perhaps to incentivize mitigation/climate-related/resiliency planning and statutes at the local level.

Section 6: Mitigation Strategy

6.1 Mitigation Strategy

The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Stafford Act directs hazard mitigation plans to describe hazard mitigation actions and establish a strategy to implement those actions. Therefore, all other requirements for a hazard mitigation plan lead to and support the mitigation strategy.

Actions will be implemented as funding and capabilities allow and monitored on an annual basis.

To promote the State's mitigation strategy, members of the State Hazard Mitigation Council will:

- Conduct outreach activities that address the hazards identified in Section 4 for the public, including at-risk populations
- Plan for crisis communications, public information, and education designed to inform and educate the public through various media about the hazards identified in Section 4, threats to public safety, and risk reduction measures
- Provide hazard mitigation information to the joint information system (JIS) that could be released during JIS activation

6.2 Mitigation Goals

The following goals have been created by the State Hazard Mitigation Council as a means of directing the mitigation strategy for the State. These goals are an update from the 2018 goals and are consistent with the hazards and vulnerabilities identified in the risk assessment.

- **GOAL 1**: Protect human life, health, and safety from the adverse effects of disasters.
- **GOAL 2:** Protect continuity of government and essential services from the adverse effects of disasters.
- **GOAL 3:** Protect communities and properties from the adverse effects of disasters, with an emphasis in Repetitive Loss (RL)/Severe Repetitive Loss (SRL) properties.
- **GOAL 4:** Mitigate emerging threats.

Additional objectives for meeting each goal are described in the following figure.

- **1.1:** Educate DEMA partners and stakeholders about mitigation.
- **1.2:** Develop and implement mitigation-related legislation, programs and capabilities of federal, state, and local governments and public-private partnerships engaged in mitigation activities.
- **1.3:** Assist local communities & potential grant applicants with implementing their hazard mitigation programs.
- **1.4:** Improve the proficiency of the mitigation program within the State of Delaware.

GOAL 1: Protect human life, health, and safety from the adverse effects of disasters.

- **2.1:** Promote mitigation as an effective means of reducing impact of future disasters.
- **2.2:** Coordinate & develop mitigation projects to protect community lifelines & CIKR, while promoting recovery capabilities.
- **2.3:** Educate & support state and local officials on available risk reduction techniques.
- **2.4:** Expand mitigation participation via community outreach initiatives and integration of mitigation-related plans.
- **2.5:** Investigate emerging & unknown threats and their implications on state assets.

GOAL 2: Protect continuity of government and essential services from the adverse effects of disasters.

- **3.1:** Develop partnerships with government, businesses, land developers, real estate professionals, etc. to develop outside of hazard areas and promote disaster-resistant development inside hazard areas for government, businesses, land developers, real estate professionals, etc.
- **3.2:** Reduce the number of existing Severe Repetitive Loss and Repetitive Loss properties and properties in dam innundation zones.
- **3.3:** Improve the public perception of risk avoidance through outreach for a more informed community.
- **3.4:** Increase participation in the NFIP, CRS, and other programs that serve to lessen the adverse impact of disaster property losses.

GOAL 3: Protect communities and properties from the adverse effects of disasters, with an emphasis in RL/SRL properties.

- **4.1:** Facilitate the enhancement of state and local emergency operations planning and preparedness and provide related training and technical assistance.
- **4.2:** Facilitate the capabilities of the state and local governments to handle the effects of disasters and to address recovery issues in the aftermath of disasters.
- **4.3:** Encourage integration of relevant data into statewide GIS initiatives to facilitate analysis and evaluation of existing, proposed and future hazard mitigation projects.

GOAL 4: Mitigate emerging threats.

Figure 60: State Mitigation Goals & Objectives

These goals and objectives will be reviewed as part of the regular plan review and maintenance process. They will also be reviewed in conjunction with the review/approval process of local hazard mitigation plans. This will help ensure that state and local hazard mitigation plans complement each other and that both state and local governments are working together to accomplish the mitigation goals of the State of Delaware. Additionally, proposed mitigation projects will be reviewed to determine how mitigation projects help state and local governments meet established goals.

6.3 Mitigation Action Items

Numerous actions can be taken, and hazard mitigation interventions put in place, to minimize the impacts of hazards and reduce the overall risk of disasters, while also increasing community resilience. Some actions cut across multiple hazards while others are uniquely designed to address a single hazard. A comprehensive range of action types include:

- Plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education and awareness programs

6.3.1 Previous Mitigation Action Items

The status of the active action items identified in the 2018 SHMP are listed below. Actions **deleted** are no longer a priority and/or are too vague in nature to continue. Actions **deferred** are deferred to this edition of the SHMP. The full description of each action can be found in the 2018 SHMP.

Table 102: Status of 2018 Action Items

STATUS	2018 ACTIVE ACTIONS
Completed	3. The State of Delaware will consider flood hazard vulnerability when identifying "designated growth areas" in certified comprehensive plans.
Completed	9. Strongly encourage sewer line check valves for new construction or the repair of sewer lines in the 100 and 500-year floodplain.
Completed	14. Develop Memorandum of Understanding with the University of Delaware Disaster Research Center to provide staff and graduate students to assist the Delaware Emergency Management Agency address hazard mitigation – related research questions.
Completed	22. Encourage local governments to continue to relocate shoreline buildings outside the Special Flood Hazard Area (SFHA), when elevation is not a cost-effective alternative.
Completed	27. Research the feasibility to remove dead trees that pose a threat to power lines, road right of ways and property. Trees prone to wind damage should be replaced with more appropriate species, if possible.
Completed	28. Conduct vulnerability assessment of hospital back-up power sources.
Completed	29. Assess the accuracy of current digital Flood Insurance Rate Maps and aerial base maps and prioritize improvements to both based on flood hazard vulnerability and development patterns.
Completed	34. Assess the vulnerability of access and egress routes to hospitals within the State of Delaware.
Completed	35. Develop base flood elevations in areas which are prone to flooding and a FEMA detailed flood study has not been conducted.
Completed	38. Train State and local floodplain managers in the use of GIS-based digital floodplain maps.
Completed	39. Utilize existing architectural expertise and engineering services to assist in pre and post-disaster structural evaluation and stabilization.
Completed	45. Formalize assistance to Delaware communities in developing community resiliency plans and integrating hazard mitigation into local plans.
Completed	46. Coordinate with the Counties and the University of Delaware on a potential grant for the update of their local mitigation plans.
Completed	47. Support mitigation actions eligible under the Unified Hazard Mitigation Assistance program.

STATUS	2018 ACTIVE ACTIONS
Completed	48. Work closely with DNREC, the University of Delaware, and DGS on developing and encouraging the use of an early warning and monitoring system for coastal flooding
Completed	51. Complete the sensors -on-roads projects that provides for real time monitoring of water levels in river and stream areas considered high risk areas.
Completed	53. Develop a Hurricane Evacuation Study.
Completed and Ongoing	5. Strongly encourage riparian buffer requirements. Recommend environmentally sensitive development such as greenways and trails as opposed to commercial and residential development. (Delaware Riparian
Completed and Ongoing	6. Encourage greenways “zoning” along river corridors.
Completed and Ongoing	7. Strongly encourage that all new construction of wastewater treatment plants occurs outside of the 100-year floodplain.
Completed and Ongoing	11. Continue to host semi-annual meetings of the State Hazard Mitigation Council. The Council may be convened following federal disaster declarations, if the situation warrants.
Completed and Ongoing	12. *Maintain* inter-agency collaboration with the Office of State Planning, the University of Delaware Disaster Research Center, Delaware Geological Survey, and floodplain management to assist with hazard data collection and analysis.
Completed and Ongoing	18. Conduct periodic benefit-cost training workshops for DEMA staff, members of the State Hazard Mitigation Council and county and local government officials.
Completed and Ongoing	19. Consider the use of shoreline protection measures, including inlet stabilization, beach nourishment and dune enhancement.
Deferred	41. Enhance disaster resistance of state facilities through the implementation of measures identified in existing and new studies.
Deferred	52. Evaluate and improve the mitigation eligibility and application process to maximize the use of available mitigation funding.
Deleted	1. Consider the inclusion of a generator “quick-connect” in the design of new structures, specifically critical facilities, constructed (fully or in part) with public funds.
Deleted	2. Develop stringent State flood hazard real estate disclosure requirements.
Deleted	4. Continue to promote local prohibitions on the use of fill in order to remove the property from the floodplain or to support re-mapping.
Deleted	8. Strongly encourage the disaster resistance of shelters through the implementation of measures identified in existing and new studies.
Deleted	10. The State of Delaware should limit State expenditures (infrastructure investments) in identified hazard areas. Limits placed on expenditures should be incorporated into the most recent Strategies for State Policies and Spending document.
Deleted	13. Develop property-specific mitigation plans for Delaware State museums, historic properties and all publicly-owned historic properties.
Deleted	21. Install video cameras in and around all school buildings.
Deleted	25. Require the flood-proofing of on-site residential septic systems located in the 100-year floodplain.
Deleted	26. Encourage the acquisition of land in flood-prone areas.
Deleted	32. Assist communities with the enforcement of state stormwater management regulations.

STATUS	2018 ACTIVE ACTIONS
Deleted	33. Conduct in-depth vulnerability assessment of state-owned facilities, to include the prioritization of possible retrofitting strategies.
Deleted	40. Develop coordinated community-level disaster education initiative involving State, county and non-governmental organizations.
Deleted	42. Emphasize, prioritize, and target Repetitive Loss (RL), Severe Repetitive Loss (SRL), and hazard-prone properties; in every aspect of mitigation funding, planning, and outreach.
Deleted	43. Validate repetitive loss data to provide more accurate addressing and mapping. Work with FEMA annually and following Declared disasters to ensure all eligible RL or SRL properties are listed.
Deleted	44. Track status of all mitigation actions around the state.
Deleted	49. Develop standalone generator project applications.
In Progress	15. Increase the number of CRS communities in the State of Delaware.
In Progress	16. Improve the CRS rating among participating communities by one point per year for the next two years. After two years, a re-evaluation should occur that determines the benefit of continued class rating reductions versus the time and effort necessary to make this happen.
In Progress	17. Use Community Development Block Grant (CDBG) funds to relocate or elevate low to moderate income households that are located in the floodplain.
In Progress	20. Purchase and install emergency power sources in identified State-owned facilities.
In Progress	23. Encourage local governments to continue to floodproof or acquire commercial or public buildings where cost effective. (Acquisition should be the first consideration as it removes the property from the SFHA.)
In Progress	24. Encourage local governments to continue to elevate or acquire flood-prone residential buildings where cost effective. (Acquisition should be the first consideration as it removes the property from the SFHA.)
In Progress	30. Conduct all-hazard assessment of critical healthcare system facilities and services (both public and private) to include: nursing homes and long-term facilities, hospitals, free-standing surgery and emergency centers, State public health clinics and State service centers, Federally Qualified Health Centers, EMS facilities and dialysis centers.
In Progress	31. Conduct risk analysis and resiliency assessments for Delaware's affordable housing properties that will result in property-specific mitigation actions, and avoidance of flood prone areas.
In Progress	36. Develop centralized database of past disasters, including the impact of events and the amount and type of disaster assistance provided. Database should contain detailed information regarding completed hazard mitigation projects.
In Progress	37. Collect and document existing spatially-correct facilities data in order to more accurately assess hazard exposure and vulnerability to the impacts of hazards.
In Progress	50. Support development of education and awareness programs that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them. Emphasize advantages of Community Rating System (CRS) involvement and National Flood Insurance Program (NFIP) participation.

6.3.2 New Mitigation Action Items

In addition to the two (2) deferred 2018 actions (#41 and #52), new actions were identified by the Council after reviewing the State's risk and capability assessments. Many of the actions have a "primary" community lifeline they could impact, though multiple lifelines could be impacted. Community Lifelines can be a powerful tool for state, local, tribal, and territorial governments to use in evaluating risk and developing strategies to reduce hazard impacts.

These mitigation actions will be implemented as capabilities and community support allows.

Below is the comprehensive list of 57 new mitigation action items for the State of Delaware, organized by Responsible Department (though it is understood that other departments will assist). These actions address both natural and manmade hazards, when applicable. Actions that would take longer than FEMA's three-year period of performance to implement would be broken into phases when seeking grant funding.

Table 103: New Mitigation Actions

Responsible Agency/Department:	University of Delaware (UD)
Action 1:	Develop a water quantity portal - collect and track water levels related to drought.
Goal(s):	2, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Drought; Inland Flooding; Coastal Flooding
Primary Community Lifeline Addressed:	Food, Water, Shelter
Responsible Agency/Department:	UD CEMA
Support/Partner Agencies:	DEMA, DGS, DNREC
Estimated Cost:	$400,000
Potential Funding Source:	Grants, National Science Foundation, department budget
Implementation Schedule:	3 years
Priority:	High
Action 2:	Update the University internal hazard mitigation plans.
Goal(s):	1, 2, 3, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	UD
Support/Partner Agencies:	DEMA
Estimated Cost:	$100,000
Potential Funding Source:	Grants, department budget
Implementation Schedule:	3 years
Priority:	High
Action 3:	Conduct a stormwater flood study on the main campus and satellite campuses to identify vulnerabilities and develop strategies to mitigate damages.
Goal(s):	2, 3
Category:	Plans & Regulations
Hazard(s) Addressed:	Inland Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	UD
Support/Partner Agencies:	DNREC
Estimated Cost:	$200,000

Potential Funding Source:	Grants, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Responsible Agency/Department:	**Department of Natural Resources and Environmental Control (DNREC)**
Action 4:	Utilize green infrastructure in all future developments involving state assets, where applicable.
Goal(s):	3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Energy
Responsible Agency/Department:	Asset-specific personnel
Support/Partner Agencies:	DNREC
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	12 months for project
Priority:	Low
Action 5:	Provide regulatory incentives that encourage sea level rise adaptation and allow for innovative projects.
Goal(s):	1, 2, 3, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA
Estimated Cost:	$500,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 6:	Designate shoreline zones for adaptation action.
Goal(s):	3, 4
Category:	Natural Systems Protection
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	UD
Estimated Cost:	$1 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	High
Action 7:	Conduct a legal review for disinvestment of publicly owned infrastructure and privately owned buildings.
Goal(s):	3, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	UD
Estimated Cost:	$300,000

Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	Moderate
Action 8:	Provide targeted outreach to water and wastewater operators and water utilities about sea level rise.
Goal(s):	2, 4
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA, UD
Estimated Cost:	$20,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	Moderate
Action 9:	Provide land managers, fisheries managers, and farmers with the information and extension support necessary to manage lands and fisheries in areas affected by sea level rise.
Goal(s):	2, 3, 4
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA, DSHA
Estimated Cost:	$20,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	Low
Action 10:	Create and promote a statewide climate resiliency educational campaign.
Goal(s):	1, 2, 4
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA
Estimated Cost:	$600,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	High
Action 11:	Build capacity to conduct climate change–focused air quality modeling. [Air Quality]
Goal(s):	4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Health & Medical
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA, UD
Estimated Cost:	$200,000

Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 12:	Increase climate change–focused research and modeling. [Air Quality]
Goal(s):	4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Health & Medical
Responsible Agency/Department:	DNREC Watershed Stewardship
Support/Partner Agencies:	DEMA
Estimated Cost:	$1 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 13:	Study how to prioritize funding options to give preference to areas with effective practices for drainage and floodplain management. [Watershed Stewardship]
Goal(s):	2, 3
Category:	Plans & Regulations
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DNREC Watershed Stewardship
Support/Partner Agencies:	DEMA
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	Moderate
Action 14:	Assist local governments in developing strategies to protect wastewater treatment facilities from flooding. [Water]
Goal(s):	2, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Health & Medical
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA
Estimated Cost:	$5 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 15:	Complete Phase 2 of State Capability Assessment: update climate projections.
Goal(s):	4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	n/a

Estimated Cost:	$250,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	18 months
Priority:	High
Action 16:	Create and implement an outreach program based on the results of the climate assessment to inform the public and stakeholders of future conditions and possible mitigation strategies.
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	Sea Grant, RASCL, CEMA (etc.)
Estimated Cost:	$100,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 17:	Provide improved, interactive NFIP training for floodplain managers, developers, and land use planners.
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA, DSHA
Estimated Cost:	$100,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 18:	Fund identified dam rehabilitation projects, in order of priority set by the Dam Safety Program, to mitigate dam failure flooding.
Goal(s):	1, 2, 3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Inland Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA, DelDOT
Estimated Cost:	$50 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 19:	Create an action plan that addresses existing NFIP RL/ SRL properties and address the properties using various flood mitigation techniques, including FEMA's buyout program.
Goal(s):	4
Category:	Structural & Infrastructure Projects

Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DNREC
Support/Partner Agencies:	DEMA
Estimated Cost:	$5 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	18 months
Priority:	High
Responsible Agency/Department:	**Department of Agriculture (DOA)**
Action 20:	Provide sea level rise information to the Delaware Agricultural Land Preservation Program.
Goal(s):	1, 2, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Erosion, Coastal Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DOA
Support/Partner Agencies:	DNREC
Estimated Cost:	$1,000
Implementation Schedule:	1 year
Priority:	Moderate
Responsible Agency/Department:	**Delaware Health and Social Services (DHSS)**
Action 21:	Remove and relocate state assets from low-lying areas.
Goal(s):	3
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DHSS
Support/Partner Agencies:	DEMA
Estimated Cost:	$10 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Action 22:	Identify sites to be used as designated cooling and heating centers.
Goal(s):	1, 2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Extreme Temperatures
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DHSS
Support/Partner Agencies:	DEMA
Estimated Cost:	$1,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	6 months
Priority:	High
Action 23:	Develop and implement a statewide sewer and stormwater monitoring system to track water

	contaminants and identify potential sources of biological threats.
Goal(s):	1, 2, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Health & Medical
Responsible Agency/Department:	DHSS
Support/Partner Agencies:	DSHS, DNREC, UD
Estimated Cost:	$3 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Responsible Agency/Department:	**Department of State (DOS)**
Action 24:	Evaluate costs and benefits of creating historic preservation tax credit for adaptation and resiliency [Historical and Cultural Affairs].
Goal(s):	3
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DOS
Support/Partner Agencies:	DSHA
Estimated Cost:	$30,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	Low
Action 25:	Promote personal energy use awareness.
Goal(s):	1
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Extreme Temperatures
Primary Community Lifeline Addressed:	Energy
Responsible Agency/Department:	DOS
Support/Partner Agencies:	UD
Estimated Cost:	$50,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 26:	Mitigate below-grade facilities using any methods deemed appropriate.
Goal(s):	3
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DOS
Support/Partner Agencies:	DelDOT, DNREC
Estimated Cost:	$5 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High

Responsible Agency/Department:	Delaware State Housing Authority (DSHA)
Action 27:	Incorporate information on sea level rise in homeownership counseling.
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DSHA
Support/Partner Agencies:	DEMA
Estimated Cost:	$30,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Action 28:	Educate homeowners and tenants about defensible space and the flammability dangers of evergreens.
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Wildfires & Smoldering Fires
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DSHA
Support/Partner Agencies:	DEMA, DOA
Estimated Cost:	$1,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	Moderate
Responsible Agency/Department:	**Office of Management and Budget (OMB)**
Action 29:	Incorporate resilience into Messenger Services
Goal(s):	2
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Communications
Responsible Agency/Department:	OMB
Support/Partner Agencies:	DEMA
Estimated Cost:	$1,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 30:	Offer training opportunities for employees on impacts of climate change
Goal(s):	2
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	OMB
Support/Partner Agencies:	DNREC, DEMA
Estimated Cost:	$75,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low

Responsible Agency/Department:	Office of the Governor (OG)
Action 31:	Create legislation that requires local government to create regulations for future or remodeled properties in coastal SFHA zones to involve flood and wind mitigation measurements.
Goal(s):	3
Category:	Plans & Regulations
Hazard(s) Addressed:	Coastal Flooding, Tropical Cyclones, Severe Thunderstorms & Tornadoes
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	Office of the Governor
Support/Partner Agencies:	DEMA, DOI, DSHA, DNREC
Estimated Cost:	$500,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	5 years
Priority:	High
Responsible Agency/Department:	**Delaware Department of Transportation (DelDOT)**
Action 32:	Install additional reflective markers, fog lines, and guard rails on primary roads, roads in areas with large vulnerable populations, and evacuation routes to improve visibility on roads and mitigate life safety impacts during severe weather.
Goal(s):	1, 2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Extreme Temperatures, Severe Thunderstorms & Tornadoes, Severe Winter Weather, Tropical Cyclones, Wildfires & Smoldering Fires
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$500,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	Moderate
Action 33:	Using various methods, mitigate flooding in all identified and prioritized low-lying roads in Delaware (including an equality analysis component).
Goal(s):	1, 2, 3
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$300 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 34:	Conduct tide gauge renovations to prevent flooding.
Goal(s):	1, 2, 3

Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$1 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	High
Action 35:	Prioritize assets (Asset Management Plan) to support an efficient mitigation strategy for critical assets and better utilize resources.
Goal(s):	2
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	High
Action 36:	Develop a Resilience Improvement Plan to address capability gaps and support the State's mitigation strategy.
Goal(s):	1, 2, 3, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	2 years
Priority:	High
Action 37:	Create additional truck parking for truckers during severe weather.
Goal(s):	2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Inland Flooding, Severe Thunderstorms & Tornadoes, Severe Winter Weather
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$3 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Action 38:	Create truck parking electrification to charge trucks and illuminate parking during rest stops in order to

	have trucks properly ready for the road and to increase safety and security of critical vehicles and personnel.
Goal(s):	2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$3 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	4 years
Priority:	Moderate
Action 39:	Create microgrids for bus infrastructure in order to support mass charging capabilities and provide additional energy for future capabilities.
Goal(s):	2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$10 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	5 years
Priority:	Moderate
Action 40:	Implement Biofiltration operations and natural environmental (i.e. pollinators sites) to mitigate damages to natural environment and water supply.
Goal(s):	3
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Extreme Temperatures, Inland Flooding
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA, DNREC
Estimated Cost:	$5 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	High
Action 41:	Hire additional staffing (either internal or consultants) to improve capabilities and implement the identified mitigation activities.
Goal(s):	2, 4
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$2 Million
Potential Funding Source:	Grants, general fund, department budget

Implementation Schedule:	5 years
Priority:	High
Action 42:	Acquire more electric messaging boards to warn motorists of road damage, low water crossings, and impending weather.
Goal(s):	1, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Earthquakes, Inland Flooding, Severe Thunderstorms & Tornadoes, Severe Winter Weather, Wildfires & Smoldering Fires
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DEMA
Estimated Cost:	$800,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	High
Action 43:	Install alternative power supplies where applicable (wind power, generators, solar options, etc.) to alleviate pressure on power grid.
Goal(s):	2
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Energy
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	UD, DSHS
Estimated Cost:	$50 Million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	6 months per installment
Priority:	Moderate
Action 44:	Explore new pavement technology to curb flooding and urban heat islands.
Goal(s):	2, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Extreme Temperatures, Inland Flooding
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	UD
Estimated Cost:	$5 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Action 45:	Enhance stormwater management capabilities by enlarging drainage ditches and culverts, creating additional storm drains, and utilizing medians for bioswales and water-absorbing landscaping to mitigate flash flooding and eliminate the need for low-water crossings.
Goal(s):	1, 2, 3

Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	Coastal Flooding, Inland Flooding
Primary Community Lifeline Addressed:	Transportation
Responsible Agency/Department:	DelDOT
Support/Partner Agencies:	DNREC
Estimated Cost:	$10 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	10 years
Priority:	High
Responsible Agency/Department:	**Delaware Emergency Management Agency (DEMA)**
Action 46:	Create, explore, and/or fund pilot or kick-starter projects that have components of hazard mitigation. If successful, utilize the project statewide. Projects can be from any sector (public, private, educational, etc.)
Goal(s):	1, 2, 3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	UD, DelDOT, DNREC
Estimated Cost:	$50 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	10 years
Priority:	Moderate
Action 47:	Enhance the power grid and energy infrastructure to accommodate the national push for electrical vehicles (EVs) and the possible charging surge during an evacuation.
Goal(s):	1, 2, 3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Energy
Responsible Agency/Department:	DEMA, DNREC & Private
Support/Partner Agencies:	UD, DelDOT, OMB
Estimated Cost:	$100 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	20 years
Priority:	High
Action 48:	Protect and secure critical infrastructure & community lifelines to mitigate impacts from natural and manmade threats and make more resilient.
Goal(s):	1, 2, 3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DSHS (DEMA)
Support/Partner Agencies:	DelDOT, DEMA, Facility Managers
Estimated Cost:	$5 million
Potential Funding Source:	Grants, general fund, department budget

Implementation Schedule:	3 years
Priority:	High
Action 49:	Create a resource database for information required in the mitigation plans and grant applications that state & local government staff can easily access.
Goal(s):	2
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	DSHS, DSHA, DNREC
Estimated Cost:	$500,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	1 year
Priority:	High
Action 50:	Develop and implement statewide rebate programs for various residential mitigation actions (i.e. storm shelters, shade trees, water-garden plants, rain harvesting barrels).
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	Natural Hazards
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	DSHA, DNREC, DGS, UD, DOI
Estimated Cost:	$500,000 each
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 51:	Increase the ability and capabilities within state agencies to meet mitigation demand by acquiring specialized skills and providing ongoing training and professional development for risk reduction measures.
Goal(s):	2, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	DSHS
Estimated Cost:	$75,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Moderate
Action 52:	Create a statewide, annual mitigation or resilience education campaign that involves public messaging, trainings and workshops, community lunch-n-learns, student contests, news broadcasts, billboard advertisements, and local project recognitions (via public ceremonies and awards).
Goal(s):	1, 2, 3, 4

Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	All departments
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 53:	Purchase and distribute NOAA weather radios, go-kits, and other emergency supplies to vulnerable residents.
Goal(s):	1, 3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA, DHSS
Support/Partner Agencies:	DSHA, DHSS
Estimated Cost:	$100,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 54:	Create partnerships with insurance and local government to improve insurance coverage on hazard-prone properties.
Goal(s):	3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	DSHA, DOI
Estimated Cost:	$10,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 55:	Conduct a study to 1) identify what capabilities the state is lacking that would enhance the state's mitigation capabilities and 2) identify how to improve the existing capability assessment process.
Goal(s):	2, 4
Category:	Plans & Regulations
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	OSPC
Estimated Cost:	$300,000
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low

Action 56:	Install quick-connect and acquire generators for primary shelters.
Goal(s):	1, 2, 3, 4
Category:	Structural & Infrastructure Projects
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Food Water Shelter
Responsible Agency/Department:	DEMA & Shelter Managers
Support/Partner Agencies:	DSHS, DHSS
Estimated Cost:	$2 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low
Action 57:	Promote FEMA's home buyout program to eliminate RL/SRL properties.
Goal(s):	3
Category:	Education & Awareness Programs
Hazard(s) Addressed:	All
Primary Community Lifeline Addressed:	Safety & Security
Responsible Agency/Department:	DEMA
Support/Partner Agencies:	DSHA, DNREC, OMB
Estimated Cost:	$10 million
Potential Funding Source:	Grants, general fund, department budget
Implementation Schedule:	3 years
Priority:	Low

6.3.3 Estimated Benefits

During the capability assessment and hazard analysis, previously impacted assets and populations were analyzed to determine the highest probability of damage and potential of loss of life per hazard. To determine the estimated benefit of each action item, data from the NIBS 2017 Interim Report was used to develop a cost-benefit analysis. The report states that every $1 spent in mitigation saves a community an average of $6 in recovery.[16] With this method, the estimated cost of every action can be multiplied by six (6) to determine the estimated benefit of each action.

6.3.4 Priority

Priority has not changed since the last plan. Priority of state mitigation actions, including actions addressing dams, will go towards projects that are cost-effective, environmentally sound, and technically feasible and have 1) the highest positive impact on vulnerable populations and 2) the highest impact on overall community resilience. The current list of actions used a priority score of High, Moderate, or Low that are based on these priorities.

Additionally, the STAPLEE method will be used to evaluate and prioritize actions when applying for funding. The STAPLEE evaluation method uses seven (7) criteria for evaluating a mitigation action: Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Within each of those criteria are additional considerations. Actions with the highest score will be considered to have higher success potential.

[16] Natural Hazard Mitigation Saves: 2017 Interim Report. National Institute of Building Science. < https://www.nibs.org/page/mitigationsaves>

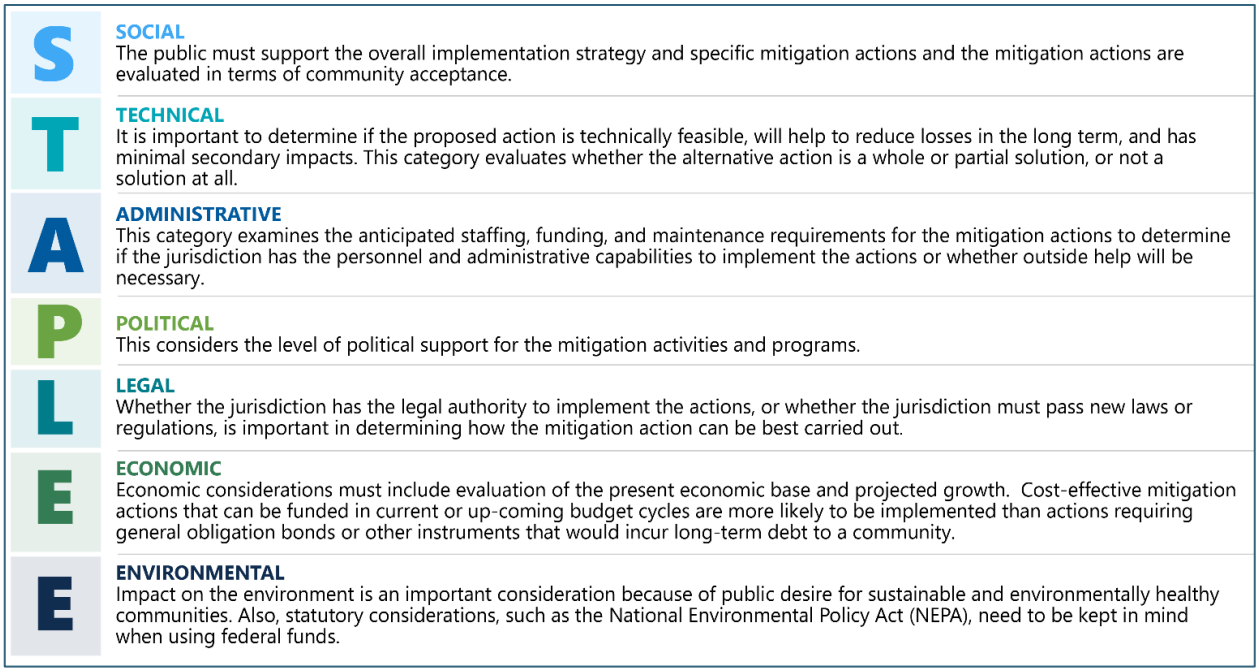

Figure 61: STAPLEE Method

Prioritization may change over time in response to changes in community characteristics and risks and to take advantage of available resources.

6.4 Potential Funding Sources

All mitigation actions are planned to be funded by state funds, department budgets, soft match, or outside loans and grants.

Under the Code of Federal Regulations (CFR) Title 44, Part 201.4 (44 CFR §201.4), State Mitigation Plans, the State must have a Federal Emergency Management Agency (FEMA)-approved hazard mitigation plan in order to apply for and/or receive hazard mitigation project grant funds from the following federal Hazard Mitigation Assistance (HMA) programs:

1. Hazard Mitigation Grant Program (HMGP)
2. HMGP Post Fire Program
3. Building Resilient Infrastructure and Communities (BRIC)
4. Flood Mitigation Assistance (FMA)
5. Safeguarding Tomorrow Revolving Loan Fund (RLF)
    a. As the newest FEMA HMA program (est. January 1, 2021), the Safeguarding Tomorrow RLF is the first HMA program to provide capitalization grants to eligible state, territorial, and tribal governments for revolving loan funds. Awarded grant funding will be used by an applicant to administer its revolving loan fund and provide direct loans to local governments based on its unique mitigation needs and priorities.

The State of Delaware has used many of these FEMA HMA programs for various mitigation projects since 2000. This list was described in **Section 4.4.3.2 Factors that Decrease Vulnerability**. Under these HMA programs, the following activities are eligible for funding.

Table 104: Eligible Activities for Mitigation Projects and Capability and Capacity Building Grants [17]

Eligible Activities	HMGP	HMGP Post Fire	BRIC	FMA	Safeguarding Tomorrow RLF*
Mitigation Projects					
Property Acquisition	x	x	x	x	x
Structure Elevation	x	x	x	x	x
Mitigation Reconstruction	x	x	x	x	x
Flood Risk Reduction Measures	x	x	x	x	x
Stabilization	x	x	x	x	x
Dry Floodproofing Non-Residential Buildings	x	x	x	x	x
Tsunami Vertical Elevation	x	x	x	x	x
Safe Rooms	x	x	x		x
Wildfire Management	x	x	x		x
Retrofitting	x	x	x	x	x
Generators	x	x	x		x
Earthquake Early Warning Systems	x	x	x		x
Innovative Mitigation Projects	x	x	x	x	x
Capability and Capacity Building					
New Plan Creation and Updates	x	x	x	x	x
Planning-Related Activities	x	x	x	x	x
Project Scoping/Advance Assistance	x	x	x	x	x
Financial Technical Assistance				x	

***The Safeguarding Tomorrow RLF program provides capitalization grants to eligible entities to issue loans to local governments to fund a variety of mitigation activities listed in the table above.*

Mitigation activities can and should be implemented through a variety of funding streams. FEMA funding sources, including Public Assistance, HMGP, the BRIC program, the FMA program, and Sections 404 and 406 of Hazard Mitigation Funding, tend to be relied on heavily for mitigation action completion. However, it is important to research and leverage other available funding opportunities and not to limit funding sources to FEMA assistance programs.

Funding opportunities may include other federal agencies; state, local, and tribal programs, as applicable; or private funding. In addition to funding, mitigation implementation resources, such as regulatory and technical assistance, are available to assist jurisdictions in completing action items and integrating mitigation into planning and resilience efforts.

[17] "Summary of FEMA Hazard Mitigation Assistance (HMA) Programs." *Fema.gov*, https://www.fema.gov/fact-sheet/summary-fema-hazard-mitigation-assistance-hma-programs.

Table 105: Sources for Mitigation Funding and Assistance from Federal Agencies and Organizations

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
Grants.gov	Searchable catalog of federal grant opportunities across agencies.	U.S. Department of Health and Human Services	http://www.grants.gov/web/grants/home.html	x	x	x
Federal Grant Programs for State and Local Governments	Website that lists types of FEMA grant programs, and includes policies, eligibility, agencies, and type of funding instrument.	FEMA	https://www.grants.gov/web/grants/search-grants.html?keywords=FEMA		x	x
National Earthquake Hazards Reduction Program	Provides research to advance understanding of earthquakes, their impact, and risk-reduction opportunities.	National Institute of Standards and Technology, National Science Foundation (NSF), and U.S. Geological Survey	http://www.nehrp.gov/index.htm		x	
Emergency Relief Program	Provides funding for repair or reconstruction of federal-aid highways and roads on federal lands that have suffered serious damage because of natural disasters or catastrophic failures from an external cause.	U.S. Department of Transportation Federal Highway Administration	https://www.fhwa.dot.gov/programadmin/erelief.cfm			X
Decision, Risk, and Management Science Program	Scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society.	NSF	https://beta.nsf.gov/funding/opportunities		x	
Aquatic Ecosystem Restoration	This program helps to restore significant ecosystem function, structure, and dynamic processes that have been degraded.	U.S. Army Corps of Engineers (USACE)	http://www.nae.usace.army.mil/Missions/Public-Services/Ecosystem-Restoration-Authorities/	x	x	x
Beneficial Uses of Dredged Materials	Direct assistance for projects that protect, restore, and create aquatic and ecological habitats, including connection with dredging in authorized federal wetlands, in navigation projects.	EPA	https://www.epa.gov/cwa-404/beneficial-use-dredged-material-under-cwa-section-404	x	x	x
Water Grants	A variety of grants related to water and wastewater infrastructure projects, including a catalog of federal funding for watershed protection projects.	EPA	https://www.epa.gov/nps/watershed-funding		x	x
Urban Waters Small Grants Program	Programs that protect and restore urban waters by improving water quality through activities that also support community	EPA	https://www.epa.gov/urbanwaterspartners/urban-waters-small-grants		x	x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	revitalization and other local priorities.					
Funding and Technical Assistance for Climate Adaptation	Multiple resources about technical and funding assistance for green infrastructure, Smart Growth, and creating resilient water utilities.	EPA	https://www.epa.gov/arc-x/federal-funding-and-technical-assistance-climate-adaptation		x	x
Community Development Block Grant (CDBG)	Grants to states and local governments to develop viable communities (e.g., housing, suitable living environment, expanded economic opportunities) and recover from federally declared disasters. Principally for low- and moderate-income areas.	U.S. Department of Housing and Urban Development (HUD)	https://www.hud.gov/program_offices/comm_planning/cdbg	x	x	x
Disaster Housing Assistance Program	Emergency assistance for housing, including minor repair of homes to establish livable conditions, and mortgage and rental assistance.	HUD	https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/publications/dhap			x
HOME Investment Partnerships Program	Grants to state and local government and consortia for permanent and transitional housing, including financial support for property acquisition and rehabilitation for low-income persons.	HUD	https://www.hud.gov/program_offices/comm_planning/home			x
HUD Disaster Resources	Grants and a variety of disaster assistance related to housing, including mortgage assistance.	HUD	https://portal.hud.gov/hudportal/HUD?src=/info/disasterresources			x
CDBG Section 108 Loan Guarantee	Offers states and local governments financing for certain community development activities, such as housing rehabilitation, economic development, and large-scale physical development projects.	HUD	https://portal.hud.gov/hudportal/HUD?src=/hudprograms/section108			x
NFIP	Formula grants to states to assist communities in complying with NFIP floodplain management requirements; Community Assistance Program–State Support Services Element.	FEMA	https://www.fema.gov/national-flood-insurance-program	x		
HMA Grant Program	Grants to provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. **Includes FMA, HMGP,**	FEMA	http://www.fema.gov/hazard-mitigation-assistance		x	x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	HMGP Post Fire, and BRIC, which are detailed below.					
FMA Grant Program	Grants to states and communities for pre-disaster mitigation planning and projects to help reduce or eliminate the long-term risk of flood damage to structures insurable under the NFIP.	FEMA	http://www.fema.gov/flood-mitigation-assistance-program		x	x
HMGP	Grants to states and communities for planning and projects providing long-term hazard mitigation measures following a major disaster declaration.	FEMA	http://www.fema.gov/hazard-mitigation-grant-program		x	x
HMGP Post Fire	Grants available to help communities implement hazard mitigation measures after wildfire disasters.	FEMA	https://www.fema.gov/grants/mitigation/post-fire			x
BRIC Grant Program	Grants for mitigation activities that support priorities including natural hazard risk reduction activities that mitigate risk to public infrastructure and community lifelines.	FEMA	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities	x	x	x
PA: Hazard Mitigation Funding under Sections 404 and 406 of the Stafford Act	Hazard mitigation discretionary funding available under Sections 404 and 406 of the Stafford Act following a federally declared disaster.	FEMA	https://www.fema.gov/95261-hazard-mitigation-funding-under-section-406-stafford-act			x
Assistance to Firefighters Grant Program	Assists in local funding for fire equipment, staffing, facility construction, and emergency response costs.	FEMA	https://www.fema.gov/welcome-assistance-firefighters-grant-program			x
Emergency Watershed Protection	Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.	U.S. Department of Agriculture (USDA)–National Resources Conservation Service (NRCS)	http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp		x	x
FEMA PA Grant Program	The objective of the FEMA PA Grant Program is to provide assistance to state, tribal, and local governments and certain types of private non-profit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.	FEMA	http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit			x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
Partners for Fish and Wildlife	Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats.	U.S. Fish and Wildlife Service (FWS)	https://www.fws.gov/program/partners-fish-and-wildlife		x	x
Emergency Supplemental Historic Preservation Fund grant program (*usually referred to as Disaster Recovery Grants*)	Federal financial assistance from the Historic Preservation Fund to assist impacted communities via grants.	National Park Service	https://www.nps.gov/subjects/historicpreservationfund/disaster-recovery.htm#:~:text=In%20addition%20to%20assisting%20with%20the%20immediate%20needs,are%20integrated%20with%20statewide%20hazard%20mitigation%20planning%20efforts.		x	x
Federal Highway Administration Emergency Relief Program	Funding for the repair or reconstruction of federal-aid highways that have suffered serious damage as a result of natural disasters or catastrophic failures from an external cause.	U.S. Department of Transportation (DOT)	http://www.fhwa.dot.gov/programadmin/erelief.cfm			x
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Investing in surface transportation infrastructure for roads, bridges, transit, rail, ports, or intermodal transportation. Replaces previous TIGER and BUILD programs.	DOT	https://www.transportation.gov/RAISEgrants/about		x	x
Emergency Farm Loans Program	USDA's Farm Service Agency provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters, or quarantine.	USDA	https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/emergency-farm-loans/			x
Landscape Planning Programs	Planning and programs that help improve natural resource management. Includes the Emergency Watershed Protection Program, the Watershed and Flood Prevention Operations Program, and the Watershed Rehabilitation Program.	USDA–NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/		x	x
Regional Conservation Partnership Program	Co-investment funding for partners to implement projects that address on-farm, watershed, and regional natural resource concerns.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/rcpp/	x	x	x
Environmental Quality Incentives Program	Provides financial and technical assistance to agricultural producers and	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/	x	x	x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	non-industrial forest managers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or created wildlife habitat, and mitigation against drought and increasing weather volatility.		national/programs/financial/eqip/			
Conservation Innovation Grants (CIG)	A competitive program that supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private agricultural lands. CIG works to address water quality, air quality, soil health, and wildlife habitat challenges.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/			x
Conservation Technical Assistance Program	Provides farmers, ranchers, and forestland owners with the knowledge and tools they need to conserve, maintain, and restore the natural resources on their lands and improve the health of their operations for the future.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/		x	
Financial Assistance	Financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy and improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forestland.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/		x	x
Easement Programs	Programs that provide financial and technical assistance to help landowners conserve agricultural lands and wetlands and their related benefits.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/		x	x
Healthy Forests Reserve Program	Helps landowners restore, enhance, and protect forestland resources on private lands through easements and financial assistance.	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/forests/		x	x
Land and Water Conservation Fund	Funding allows four federal agencies to acquire and develop private lands for	U.S. Bureau of Land Management, U.S. Forestry Service,	http://www.lwcfcoalition.org/		x	x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	public outdoor recreation areas and facilities, and congressional appropriation for matching funds for state and local government land acquisition projects.	FWS, and National Park Service (NPS)				
Flood Risk Management Program	Fosters public understanding of the options for dealing with flood hazards and promotes prudent use and management of the nation's floodplains. Types of assistance include general technical services and general planning guidance.	USACE	https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/	x	x	x
Missions and Appropriations	Federal budget and funding to support USACE missions, including research, feasibility studies, construction, and disaster relief.	USACE	https://www.usace.army.mil/Missions/	x	x	x
U.S. Small Business Administration (SBA) Disaster Loan Assistance	SBA provides low-interest, long-term loans for physical and economic damage caused by a declared disaster. These include home and personal property loans, business physical disaster loans, economic injury disaster loans, and military reservist economic injury loans.	SBA	https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans			x
Community Emergency Response Team	Nine-week citizen training program for disaster preparedness and basic disaster response skills for individuals, families, neighborhoods, community organizations, and businesses.	FEMA and state and local governments	https://community.fema.gov/PreparednessCommunity/s/welcome-to-cert		x	
Forest Legacy Program	Encourages the protection of privately owned forestlands through conservation easements or land purchases.	U.S. Forest Service and USDA	https://www.fs.usda.gov/managing-land/private-land/forest-legacy			x
Historic Preservation Fund Disaster Recovery Grant Program	Provides financial assistance for the immediate needs of historic-property owners after a disaster. The program is designed to foster partnerships between local, state, and federal community planners to ensure that important cultural resources are integrated with statewide hazard mitigation planning efforts.	NPS	https://www.nps.gov/subjects/historicpreservationfund/disaster-recovery.htm		x	x

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
National Trust for Historic Preservation Grants	Offers grants that are primarily for planning preservation projects, though some special programs focus on preservation planning in particular fields or geographic regions or allow for the funding of physical preservation work.	National Trust for Historic Preservation	https://forum.savingplaces.org/build/funding/grant-seekers			x
North American Wetlands Conservation Act	Offers grants to protect wetlands that provide valuable benefits such as flood control, reducing coastal erosion, improving water and air quality, and recharging ground water.	FWS	https://fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-standard			x
Homeland Security Grant Program	Supports efforts to build and sustain core capabilities across the five mission areas of Prevention, Protection, Mitigation, Response, and Recovery based on allowable costs.	U.S. Department of Homeland Security	https://www.fema.gov/homeland-security-grant-program		x	x
National Fire Plan (NFP)	The NFP provides technical, financial, and resource guidance and support for wildland fire management across the United States. Addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.	Forest Service, U.S. Department of the Agriculture	https://www.fs.usda.gov/detail/r2/landmanagement/projects/?cid=stelprdb5199587		x	x

Table 106: Sources for Mitigation Funding and Assistance from National Non-Profit Organizations

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
American Red Cross	Shelter, food, support, supplies, and direct assistance to populations impacted by disaster.	American Red Cross, National Capital & Greater Chesapeake Region	https://www.redcross.org/local/dc-va-md-de.html		x	x
The Nature Conservancy	Conservation organization partnering with communities, business, government, and other nonprofits to protect ecologically important lands and	The Nature Conservancy	https://www.nature.org/en-us/		x	x

	waters for nature and people.					
The Trust for Public Land	Assistance to state and local governments, including land conservation transactions, conservation finance, and park design and development.	The Trust for Public Land	http://www.tpl.org/services/conservation-finance		x	x
Public Health Programs	Provides funding, expertise, information, leadership, and/or connections to specific groups of people for projects addressing priority public health challenges.	CDC Foundation	http://www.cdcfoundation.org		x	x

Table 107: Sources for Mitigation Funding and Assistance for Dams

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
Nonemergency Dam Repair Grants	The agency may provide grants from the nonemergency dam repair fund to dam owners to defray the costs of repairing dams which the agency determines to be dangerous to the safety of life and property but which are not in an emergency condition. Grants shall be provided on such terms and conditions as may be imposed by the agency and may be in addition to loans granted under Section 1185.	DNREC Division of Soil and Water Conservation				X
Nonemergency Dam Repair Loans	The agency may grant loans from the nonemergency dam repair fund to dam owners to defray the costs of repairing dams which the agency determines to be dangerous to the safety of life and property but which are not in an emergency condition. Loans shall be granted on such terms and conditions as may be imposed by the agency.	DNREC Division of Soil and Water Conservation				X
Nonemergency Dam Repair Fund	The nonemergency dam repair fund is funded through monies appropriated by the legislature, agency inspection fees collected, filing fees collected pursuant to Section 1125 and Section 1134,	DNREC Division of Soil and Water Conservation				X

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	payments of principal and interest collected by the agency pursuant to Section 1184, civil penalties collected pursuant to Section 1204, monies paid to the fund pursuant to directive of the legislature and all interest earned on the investment of monies in the fund by the state treasurer.					
Emergency Dam Repair Fund	The emergency dam repair fund is funded through monies appropriated by the legislature and monies collected by the agency in full or partial satisfaction of liens created by Subsection 1184(c). Monies in the fund shall be used to employ remedial measures necessary to protect life and property in accordance with provisions of Section 1180 and Section 1181. The agency shall administer the fund. On notice from the agency, the state treasurer shall invest and divest monies in the fund and monies earned from investment shall be credited to the fund. Monies in the emergency dam repair fund are exempt from lapsing.	DNREC Division of Soil and Water Conservation				X
Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program	The Rehabilitation of High Hazard Potential Dams Grant (HHPD) awards provide technical, planning, design and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. A state or territory with an enacted dam safety program, the State Administrative Agency, or an equivalent state agency, is eligible for the grant.	FEMA	https://www.fema.gov/emergency-managers/risk-management/dam-safety/rehabilitation-high hazard-potential-dams	x	x	x
Dam Preservation Program	This unique partnership between DNREC and DelDOT, a first in the country, established a commitment of annual funding for maintaining and rehabilitating state regulated dams, as well as a commitment of shared resources between DNREC and DelDOT.	DNREC-DelDOT	https://deldot.gov/Programs/dam-preservation/	x	x	
The Delaware Dam Safety Program	The Delaware Dam Safety Program works to reduce the risk of failure of dams and to prevent	DNREC	https://dnrec.alpha.delaware.gov/watershed	x	x	

Program or Source	Description	Lead Agency or Agencies	Internet Resource	Type		
				Regulatory	Technical	Financial
	injuries, property damage, and loss of reservoir storage due to dam failure. It oversees the design and construction, operation and maintenance, and inspection of regulated dams in Delaware.		- stewardship/waterways/dam-safety/			
Association of State Dam Safety Officials (ASDSO)	The mission of ASDSO is to improve the condition and safety of dams and lower the risk of dam failures through education, support for state dam safety programs, and fostering a unified dam safety community.	ASDSO	https://www.damsafety.org/	x	x	
National Performance of Dams Program	A national effort headquartered at Stanford University to retrieve, archive and disseminate information on dams and their performance in the United States.	Stanford	http://npdp.stanford.edu/		x	

6.5 Incorporation into Existing Planning Mechanisms

Although it is recognized that there are many benefits to integrating components of this State Hazard Mitigation Plan (SHMP) into other planning mechanisms, the State considers this SHMP, including development and maintenance, to be the primary vehicle to ensure implementation of state hazard mitigation actions.

The primary means for integrating mitigation strategies into other planning mechanisms will be through the revision, update, and implementation of individual plans that require specific planning and administrative tasks (for example, plan amendments, ordinance revisions, and capital improvement projects).

The members of the Council will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions are consistent with the goals and actions of the SHMP and will not contribute to increased hazard vulnerability in the State.

During the planning process for new and updated planning documents, the State will provide a copy of the SHMP to the appropriate parties and recommend that all goals and strategies of new and updated planning documents are consistent with and support the goals of the SHMP and will not contribute to increased hazard impacts.

The Council will establish a process in which the mitigation strategy, goals, objectives, and actions outlined in this plan will be incorporated into the existing planning strategies.

Once the SHMP is adopted, the Council will coordinate implementation with the responsible parties as well as external stakeholders, as needed.

Planning mechanisms in which the SHMP will be integrated are listed below. Integration involves addressing identified mitigation actions from the SHMP when applicable and ensuring SHMP goals are being considered during the update of these planning mechanisms.

Table 108: SHMP Integration Methods

Type of Plan or Activity	Department Responsible
Climate Framework for Delaware	DNREC
Delaware Climate Action Plan 2021	DNREC
Climate Action in Delaware Progress Report	DNREC
Delaware Wildlife Action Plan 2015-2025	DNREC
Preparing for Tomorrow's High Tide - Final Recommendations for Preparing Delaware for Sea Level Rise	
"Avoiding and Minimizing Flood Damage to State Assets" Guide	DNREC
Green Infrastructure Primer: A Delaware Guide to Using Natural Systems in Urban, Rural, and Coastal Settings	DNREC
Report: "Assessing the Legal Toolbox" for Sea Level Rise Adaptation in Delaware: Options and Challenges for Regulators, Policymakers, Property Owners, and the Public	Environmental and Natural Resources Law Clinic at Widener Law
Delaware Climate Change Impact Assessment	DNREC
Preparing for Tomorrow's High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware	DNREC
Delaware Sea Level Rise Initiative	DNREC
Delaware Estuary Living Shoreline Initiative	DNREC
Recommended Sea Level Rise Scenarios for Delaware	DNREC
DNREC Sea Level Rise Policy	DNREC
Report: Delaware Climate-Ready Workforce Pilot Project	DNREC
Delaware Open Space Program	DNREC
Conservation Easement Program	DNREC: Division of Parks & Recreation
Delaware's Forestland Preservation Program	Department of Agriculture
Delaware Climate Action Plan	DNREC
State Historic Preservation Plan	Division of Historical and Cultural Affairs
Transportation Incident Event Management Plan	Division of Traffic Solution, Session: TMC – Transportation Management Center
Delaware Strategies for State Policies and Spending	Office of State Planning Coordination (OSPC)
The Preliminary Land Use Service (PLUS)	Office of State Planning Coordination

Section 7: Local Planning Coordination and Capability Building

7.1 Local Mitigation Capabilities & Strategies

The local mitigation capability assessments examine the ability of the jurisdictions to implement and manage a comprehensive mitigation strategy. Strengths, weaknesses, and resources of the jurisdictions are identified as a means to develop an effective Hazard Mitigation Plan (HMP). The capabilities identified in these assessments were evaluated collectively to develop feasible recommendations, which support the implementation of effective mitigation activities.

The assessments include questions regarding existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities; administrative and technical capabilities; and fiscal capabilities.

The variety of ordinances and regulations used by the three counties can be found in the following table.

Table 109: Local Capability Assessment

County	HMP	DRP	CLUP	FMP	SMP	EOP	COOP	REP	SARA	TRANS	CIP	REG-PL	HPP	ZO	SO	FDPO	NFIP	CRS	BC
Kent	X	X	X	X		X	X	X	X			X		X	X	X	X		X
New Castle	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Sussex	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X		X

LEGEND:

HMP – Hazard Mitigation Plan
DRP – Disaster Recovery Plan
CLUP – Comprehensive Land Use Plan
FMP – Floodplain Management Plan / Flood Mitigation Plan
SMP – Stormwater Management Plan
EOP – Emergency Operations Plan
COOP – Continuity of Operations Plan
REP – Radiological Emergency Plan
SARA – SARA Title III Emergency Response Plan
TRANS – Transportation Plan
CIP – Capital Improvements Plan (that regulates infrastructure in hazard areas)
REG-PL – Regional Planning
HPP – Historic Preservation Plan
ZO – Zoning Ordinance
SO – Subdivision Ordinance
FDPO – Flood Damage Prevention Ordinance
NFIP – National Flood Insurance Program
CRS – Community Rating System
BC – Building Codes

Local governments (county and/or city government) have the authority to enact regulation (including general police power, building codes and building inspections, land use), acquisition of property for public use, taxation, and spending. Each of these categories can provide tools that can be used by local governments to implement hazard mitigation measures.

Police Power. Local governments have the authority to enact hazard mitigation measures, based on their authority to protect public health, safety and welfare. One means to do this is through the use of local ordinances. In addition, local governments can cite their authority to address "nuisances," which may include, under certain circumstances, those actions that make people or property more vulnerable to hazards.

Building Codes. Building codes represent a well-established regulatory tool that can be used to reduce the impacts of hazards. Local governments in the State of Delaware are granted the authority to adopt and enforce local building codes, including those specified in their Local Flood Damage Prevention Ordinance. The State of Delaware has a standard minimum building code that local governments in Delaware are empowered to enforce.

Land Acquisition. Land acquisition can be a useful tool for pursuing mitigation goals. The acquisition of land in identified hazard areas represents a permanent means to reduce the impacts of geographically defined hazards. Governments may find the most effective method for completely "hazard-proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement), thus removing the property from the private market. As part of House Bill 235, the Realty Transfer Tax for Conservation Fund established a $9 million budget to fund the acquisition and management of undeveloped land.[18] In many cases, environmentally sensitive land is also subject to significant hazard risk. Examples include coastal property and wetlands. A potential modification to the existing House Bill may include the consideration of undeveloped land that is located in identified high hazard areas, thereby reducing sprawl and hazard vulnerability simultaneously.

Taxation. The power to levy taxes and special assessments can be used by states to achieve desired aims. The power of taxation extends beyond merely the collection of revenue and can have a profound impact on the pattern of development. In the case of Delaware, the Governor signed legislation designed to reduce sprawl by imposing higher impact fees on development in areas where development was not planned. Additionally, impact fees associated with development in identified high hazard areas could be used to reduce hazard risk. The establishment of a local impact fee would require the State of Delaware Legislature to grant municipalities this authority. In the case of a State Hazard Mitigation Fee, the State may choose from a variety of revenue streams including, but not limited to: 1) fees levied on selected goods or services sold; 2) increased property taxes; or 3) a flat fee. State officials would also have to decide if those who own property located in identified hazard areas would be assessed at a higher rate.

Spending. The *Strategies for State Policies and Spending* coordinates land-use decision-making with the provision of infrastructure and services in a manner that makes the best use of our natural and fiscal resources. The Cabinet Committee on State Planning Issues, through the Office of State Planning Coordination, originally developed the first Delaware *Strategies for State Policies and Spending* document published in 1999 to provide policy guidance for state activities and serve as a framework for coordinating the plans and actions of local governments. The importance of such coordination lies in the fact that land use decisions are made at the local level, while the bulk of infrastructure (e.g., roads and schools) and services (e.g., emergency services and social services) that support land-use decisions are funded by the state. Thus, the development of this document with local governments and citizens helps to create a unified view toward growth and preservation priorities that all governments can use to allocate resources. The *Strategies* have been regularly updated every five years with the most recent version adopted in 2020. The *State Strategies* is a result of extensive coordination with local governments, citizens, and state agencies to determine what areas are most prepared for growth and where the state can make the most cost-effective investments in roads, schools, and other public facilities and services.

Additionally, local property assessments play a role in disaster damage costs and the State's opportunity to purchase and eliminate vulnerable properties through the FEMA Buyout Program. According to the county appraisal district websites, Kent County property assessments are based on 1987 property values and New Castle County's are based upon 1983 property values. Sussex County will begin a court-ordered reassessment of residential, agricultural and commercial properties in 2021.

[18] The Realty Transfer Tax for Conservation Fund was budgeted for eighteen (18) years.

Approximately 182,000 properties will be surveyed over a three-year period. New assessment values are being set at what is projected to be the fair market value of the property (i.e. the amount the property could be sold for) as of July 1, 2023.

Local governments have been educated on the importance of linking their mitigation strategies to Delaware's mitigation strategy and understand that this is an element of prioritizing actions for funding. Local government's mitigation capabilities and actions are reviewed by DEMA to ensure they effectively support Delaware's mitigation strategies against threatening hazards.

Barriers to implementing successful local mitigation strategies at the local level include the limited availability of staff and funds. The Council will continue to find ways on improving and enhancing the local mitigation capabilities over the next five years.

7.2 State Role in Local Plan Development

DEMA has provided (and will continue to provide) technical assistance to the counties and the University of Delaware in the development of their hazard mitigation plans. Assistance and training include the following:

1) *PIG-D* – A FEMA sponsored, daylong event titled Plan Implementation and Grant Development workshop (PIG-D) that provides a hands-on, outcome-oriented opportunity for local and county governments to build capacity and develop implementable hazard mitigation plans and robust grant applications.
2) *Piglet* – A state sponsored version of PIG-D which provides a Delaware specific approach to mitigation plan development, mitigation action strategies and project application creation. A panel of subject matter experts is made available to potential subapplicants to directly ask questions, seek guidance, and bounce off ideas for potential mitigation projects.
3) *Risk Reduction Consultation Planning Workshop (RRC)* – A joint workshop sponsored by DEMA, DNREC, and FEMA designed to bring federal, state and local partners to an in person event to share progress on risk reduction efforts, find areas of collaboration and discuss ways to equitably advance mitigation solutions. New technologies, methodologies and policies are discussed with forward thinking ideas to reduce risk throughout the State of Delaware.
4) *Mitigation Lunch-n-Learns* – DEMA offers periodic 1-hour virtual lunch sessions to state, county, and local agencies to provide high level overview or quick training sessions on new mitigation ideas, funding opportunities, successes/learning lessons, or policy/programmatic changes. These are informal ways of maintaining ongoing conversations related to hazard mitigation.
5) *Hazard Mitigation Planning, Training, and Technical Assistance Modules* – Specific virtual workshops developed in modular format to provide assistance to communities looking to learn more about best practices and opportunities to reduce risk when developing or updating their Hazard Mitigation Plans. These workshops are specifically tailored to assist communities during the five-year planning cycle while HMPS are prepared, implemented, and updated as part of a sustained and comprehensive process. The modules cover four topics: planning process, conducting a risk assessment, develop a mitigation strategy, and adopt, maintain and implement the plan.
6) *County Planning Grant Scope of Work Development (PGSD) and Technical Assistance* – This offering focuses specifically on Delaware's 3 counties to assist them in developing a good scope of work describing their next Hazard Mitigation Plan Update planning project. The FEMA-sponsored training provides guidance on using helpful terms, describing activities to help develop the SOW, key decisions, and provides a checklist to address the planning process, risk assessment, mitigation strategy and plan adoption and implementation.

Additional workshops, planning events and hybrid classes are being offered in 2023 and 2024, to include but not limited to: Part 406 Mitigation, BRIC-specific application development, and the Hazard Mitigation Joint Conference (2024 and beyond).

Due to its size, many of the state-local planning processes are integrated and well-coordinated in Delaware. Additionally, the State provides many of the governmental functions that in most other states are provided by local government (i.e., public health services).

This eliminates much of the “disconnect” that exists among the various entities with planning and mitigation responsibilities that occur in other states.

DEMA assists all three counties in the update of their local mitigation plans. The SHMO attends local planning meetings and provides guidance on the update requirements. The SHMO also shares risk assessment data and mitigation priorities with local governments for their plan updates by providing a copy of the most recent SHMP and data sources with the local planning lead. The time frame for this sharing process is dependent on the local priorities.

7.3 Prioritizing Local Funding

When prioritizing jurisdictions to receive planning and project grants under available federal and non-federal programs, prioritization has not changed since the last plan. A special emphasis will be placed on jurisdictions that would receive the maximum benefit from the proposed project, including:

- Communities at the highest risk with the highest vulnerability, including underserved communities and socially vulnerable populations.
- High-risk properties, including repetitive loss and severe repetitive loss structures and property within hazard-prone areas (including dam inundation zones).
- Areas under intense development pressures and areas that may experience increasingly severe impacts from climate change.

The State of Delaware will review projects that align with the State’s mitigation strategy and:

- Are in conformance with local and state hazard mitigation plans.
- Have a beneficial impact upon the designated disaster area.
- Are in conformance with 44 CFR part 9, Floodplain Management and Protection of Wetlands, 44 CFR part 10, Environmental Considerations, and Executive Orders.
- Are cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster.

Proposed projects will be reviewed by the Council Policy Group and representatives from the Advisory Group who have the project specific expertise to critically evaluate those projects being considered. Projects that are selected by the Council for funding will be sent to FEMA Region III with a request for funding.

When the Council selects proposed projects for funding, it is the responsibility of the applicant to provide all relevant project information in a timely manner.

Applicants shall have 90 days from the time at which they are notified that their proposed project has been approved to send all application information necessary to apply to FEMA for funding. This includes project description, discussion of alternatives, cost breakdown, damage prevention estimates, and requests for letters of project concurrence from environmental agencies.

If, after 90 days from the date of notification, such information has not been provided to the SHMO, the Council may select another project from the initial list of draft projects or solicit new ones. However, at the discretion of the Council, the applicant may be granted a time extension to provide necessary information.

DEMA staff is available to the locals to support any mitigation planning activities they wish to pursue, and the agency provides information and assistance as necessary to help them achieve those goals when requested.

7.4 Local Plan Review & Coordination Process

Local plans undergo a comprehensive review and evaluation process every five (5) years by the State Hazard Mitigation Council under the authority of the Governor's Executive Order #15 and DEMA policy to determine whether there have been any significant changes in the State necessitating changes in the types of mitigation actions proposed.

Steps in the review and approval process for local mitigation plans is as follows:

1. Identify necessary project funding
2. Application development
3. Contract planning support (as needed)
4. Kick-off Meeting for planning partners
5. County first draft review
6. DEMA review
7. FEMA review
8. County incorporates DEMA & FEMA feedback
9. FEMA Approvable Pending Approval letter
10. County adoption of plan
11. Final FEMA Approval

The process starts two years before the expiration of the local plan, when DEMA reminds jurisdictions of the expiration date and that funding for plan updates is available. During the update, DEMA staff will attend local planning meetings and provide technical assistance. Once a Draft is developed, DEMA will spend approximately one month reviewing the Draft and submitting feedback to the locals.

After the State Review, FEMA will dedicate approximately 45 calendars days reviewing the Draft and providing any necessary feedback. Upon receipt of a FEMA Approvable Pending Adoption (APA) Letter, participating jurisdictions will sign an adoption resolution, officially adopting the plan. According to Local Mitigation Planning Policy Guide, if jurisdictions adopt the plan more than a year after the APA date they must either:

- Validate that the information in the plan remains current with respect to both the risk assessment (no recent hazard events, no changes in development) and mitigation strategy (no changes necessary); or
- Make the necessary updates before submitting the adoption resolution to state and FEMA.

After FEMA has determined that all plan requirements have been met, including receipt of the formal adoption documentation, FEMA will provide a letter indicating the plan is approved.

7.5 Local Planning Barriers

Based on plan and jurisdiction coverage data and trends, barriers to developing or updating, adopting, and implementing FEMA-approved local hazard mitigation plans include challenges in data sharing and grant applications.

The limited public availability of data regarding critical infrastructures and NFIP RL/SRL properties required by FEMA for approval. Because state and local floodplain managers signed privacy agreements to access FEMA's NFIP Pivot Portal, they are forbidden from sharing any NFIP information to the public, which is almost counter-productive to the Portal's mission. If FEMA could provide the state and local NFIP information they want in the hazard mitigation plans, this barrier could easily be eliminated.

There is also limited understanding on the impact of climate change on the future occurrence of threatening hazards, the possibility of new hazards, and impact of critical resources and vulnerable populations.

While DNREC and the University of Delaware have developed robust research on climate change, staff continue to provide additional information as it develops and strive to use the information in better understanding local risks and in the creation of new actions and capabilities.

Another barrier to updating and implementing FEMA-approved local government mitigation plans is the overwhelming grant application process to create/update mitigation plans.

For small departments that have an emergency manager who wears multiple hats, navigating the grant process can be challenging and impractical.

To eliminate this challenge, DEMA provides technical assistance to all subapplicants as well as strives to motivate local governments by discussing mitigation strategies during damage assessments and notices of funding opportunities. Providing additional grant workshops is a DEMA goal for future grant cycles.

When it comes to barriers in adopting FEMA-approved plans, delays in adoption have led to delays in BRIC/FMA and HHPD project awards. DEMA is developing a strategy to work with local representatives on updating and adopting plans in a timely manner that would lessen the delay in project awards. Steps in this strategy include:

- Alerting local government officials of expiration of current plan within two-years of expiration date, giving local governments time to apply for funding to update the plan.
- Providing outreach to local communities.
- Presenting at local council meeting to discuss the local hazard mitigation plan and promoting the State's mitigation strategy.
- Alerting local government officials of FEMA "Approvable Pending Adoption" Letter and determining a deadline in local adoption of the plan.
- Developing and distributing adoption resolution templates for local officials to formally adopt the plan.

Section 8: Review, Evaluation, and Implementation

All members of the State Hazard Mitigation Council will be responsible for ensuring that the State Hazard Mitigation Plan is evaluated as required. This evaluation will include analysis of current mitigation projects, evaluation of success, reevaluation of future mitigation needs, and prioritization based upon changes in needs and/or capabilities of the State.

The State Hazard Mitigation Officer (SHMO), or their designee, will lead the evaluation process by:

- Facilitating the SHMP Review meetings and disseminating information.
- Collaborating on data collections and record keeping.
- Requesting updates and status reports on planning mechanisms.
- Requesting updates and status reports on mitigation actions from the agency/department responsible for coordination and implementation of each action (identified in Section 6.3.2).
- Providing mitigation training opportunities.
- Maintaining documentation of adoption resolution for the State Hazard Mitigation Plan.

The schedule, activities, and responsible personnel for this process are described in the table below.

Table 110: SHMP Update Schedule

Responsible Personnel	Activity	Update Schedule
SHMO	Track implementation of action items, changes to risk assessment, changes to capabilities, and plan integrations.	Annually
	Assess effectiveness of SHMP by evaluating completed actions, implementation processes, responsible personnel, and lessons learned.	Annually
Council	Review and evaluate progress on achieving the mitigation goals.	Annually
	Monitor the efficiency and effectiveness of various mitigation strategies and make recommendations for additional improvements.	Annually
	Track the implementation of the mitigation activities and projects identified in the mitigation strategy using “in progress” or “completed” on a checklist.	Annually
	Review the year’s hazard events and impacts, community actions that may help or hinder mitigation capabilities, and the progress of mitigation activities.	Annually
	Update the SHMP.	Every five years

The 5-year-update will include new information and analyses and a list of new and/or modified mitigation actions. The timeframe to update the SHMP is roughly one year, and during this time local risk assessments and mitigation actions from the local hazard mitigation plans are reviewed and integrated when appropriate.

The updated SHMP will be submitted for review and approval by the Federal Emergency Management Agency and presented to the governing body (Office of the Governor) for approval and adoption.

Progress towards achieving the State's mitigation strategy's goals will be evaluated by the Council using the following methods:

- Reviewing the progress status of action items
- Determining the level of positive impact of completed actions via community surveys, pre- and post- vulnerability comparison, and potential impact studies when needed
- Comparing the impact to the mitigation goals

An annual report will be made available to the state agencies in order to report progress on the actions identified in the SHMP and to provide information on the latest legislative requirements and/or changes.

The SHMP is intended to be a living document, one that can be updated over time as hazard vulnerabilities change and new policies and projects are identified, implemented and completed. If the Council determines that the recommendations warrant modification to the plan, the SHMO may initiate a plan amendment or, if conditions justify, may undertake a complete update of the plan.

Section 9: Conclusion

Through the development of this plan, the State has developed a thorough hazard history, an inventory of critical facilities, and an assessment of their current capabilities. Hazards have been identified and mitigation projects that could reduce the risk to lives and property have been compiled and prioritized.

This data, when used in conjunction with the updated information about hazard threats and vulnerabilities, will prove to be invaluable to the State and its residents.

The State Hazard Mitigation Council has been able to work together effectively and efficiently to produce this document and establish a greater awareness of risks and mitigation strategies.

This plan will continue to evolve as necessary to properly represent the threats and vulnerabilities affecting the State. Continued public participation is encouraged and will continue through the ongoing multijurisdictional hazard mitigation process. This plan, in its entirety (not limited to but including development, public participation, hazard identification, and mitigation actions), will continue to be monitored and evaluated.

Appendix A: State Capability Assessment

The follow table reflects the various types of state capabilities available to mitigate hazards impacting the State of Delaware. All capabilities are available pre- and post-disaster. With these capabilities, the State can reduce risk and improve resilience.

Planning and Regulatory Assessment

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of natural hazards.

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
Various DelDOT plans	DelDOT	Plans for evacuations, event management, detours, Dover AFB, bridges, etc. identify procedures DelDOT will take to ensure continuity of services and prioritizes life safety.
Executive Order (EO) 41: Preparing Delaware for Emerging Climate Impacts and Seizing Economic Opportunities from Reducing Emissions	Office of the Governor Cabinet Committee on Climate and Resiliency	In September of 2013, Governor Jack Markell established the Governor's Committee on Climate and Resiliency through Executive Order 41, Preparing Delaware for Emerging Climate Impacts and Seizing Economic Opportunities from Reducing Emissions. The committee is responsible for overseeing the development of an implementation plan for reducing emissions and improving Delaware's preparedness and resilience to climate impacts.
Climate Framework for Delaware	DNREC	Identifies strategies for Delaware to prepare for climate change - including 155 recommended actions to protect public health, infrastructure, the economy, and natural resources through adaptation, mitigation, and flood avoidance.
Delaware Climate Action Plan 2021	DNREC	Delaware's Climate Action Plan, which is the result of a year-long process involving residents, businesses and technical experts, is a roadmap for how the state can prepare for climate change in the decades ahead. Delaware created the plan to strategically address future climate change impacts in the state.
Climate Action in Delaware: 2016 Progress Report	DNREC	The State of Delaware released Climate Action in Delaware: 2016 Progress Report highlighting the state's progress toward mitigating and adapting to climate change and outlining some ongoing projects and next steps for state agencies.
Delaware Wildlife Action Plan 2015-2025	DNREC	In accordance with congressional requirements, Delaware's Wildlife Action Plan provides an inventory of natural resources information and conservation programs in the state, lists the species of greatest conservation needs (SGCN), their key habitats, issues, research needs, and conservation actions.
Preparing for Tomorrow's High Tide - Final Recommendations for Preparing Delaware for Sea Level Rise	DNREC	The Advisory Committee gathered input from their organizations, other stakeholder groups, and the public to determine whether barriers and opportunities for adaptation exist for the vulnerable resources identified as of high or moderate concern. The Committee established seven overall

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
		objectives for building capacity to adapt to sea level rise and grouped the final recommendations according to the objective it will most help achieve.
"Avoiding and Minimizing Flood Damage to State Assets" Guide	DNREC	Prepared by Delaware's Flood Avoidance Workgroup, this guide outlines a set of principles and instructions for ensuring that existing and future flood risks are considered during site selection and project design, as required by Executive Order 41.
Green Infrastructure Primer: A Delaware Guide to Using Natural Systems in Urban, Rural, and Coastal Settings	DNREC	Delaware's Green Infrastructure Primer, released in 2016, provides an overview of nature-based approaches that can mitigate stormwater runoff, flooding, erosion, and water and air pollution. The primer provides an introduction to green infrastructure, fact sheets regarding eight green infrastructure practices, three case studies showing examples of green infrastructure being used in Delaware, a discussion of larger-landscape-scale green infrastructure efforts, and suggested resources for more information.
Report: "Assessing the Legal Toolbox" for Sea Level Rise Adaptation in Delaware: Options and Challenges for Regulators, Policymakers, Property Owners, and the Public	Environmental and Natural Resources Law Clinic at Widener Law	This report reviews the legal tools available for sea level rise adaptation in the State of Delaware, and analyzes the legal issues related to the use of each tool. The report also discusses the current status of the tools under Delaware law, and provides recommendations for changes needed in Delaware law to make them more effective.
Delaware Climate Change Impact Assessment (DCCIA)	UD & DNREC	The report includes a summary of past climate trends and future climate projections for Delaware, and a synthesis of the best available climate science that describes current and future impacts of temperature, precipitation, and sea level rise. The climate change impacts are detailed for five key sectors including public health, water resources, agriculture, wildlife and ecosystems, and infrastructure.
Preparing for Tomorrow's High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware	DNREC	The report details the state's vulnerabilities to sea-level rise of up to 1.5 meters. It includes background information on sea level rise, a description of vulnerability assessment methods, exposure assessment tables, and risk assessments for 79 resources. Of the resources at risk from sea level rise, 16 are identified as being of high concern statewide including: beaches and dunes; coastal impoundments; dams, dikes, and levees; evacuation routes; freshwater tidal wetlands; future development areas; habitats of conservation concern; heavy industrial areas; the Port of Wilmington; protected lands statewide; roads and bridges; railroad lines, tidal wetlands; tourism and coastal recreation; U.S. Fish and Wildlife Service refuges; and wells. A comprehensive set of vulnerability maps and information on how to use them is also included in the Mapping Appendix.
Delaware Sea Level Rise Initiative Project Compendium	DNREC	The Sea Level Rise Initiative Project Compendium was released in September 2011, which provides an inventory of all of Delaware Coastal Programs' projects related to sea level rise. It is intended to help increase collaboration between agencies, reduce redundancy and overlap in projects relating to sea level rise and to relay information about new data, information and tools.
Delaware Estuary Living Shoreline Initiative	DNREC	From the Partnership for the Delaware Estuary (PDE), the Delaware Estuary Living Shoreline Initiative (DELSI) is a pilot project designed to stabilize eroding shorelines of tidal marshes.
Recommended Sea Level Rise Scenarios for Delaware	DNREC	The Recommended Sea Level Rise Scenarios were established by the Delaware Department of Natural Resources and Environmental Control (DNREC) Sea Level Rise (SLR) Technical Workgroup to support the development of the DNREC Sea Level Rise Policy. The Workgroup

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
		determined the Delaware SLR scenarios by employing published expert summaries of existing data and predictions from national and international panels and federal agencies.
Report: Delaware Climate-Ready Workforce Pilot Project	DNREC	Written in response to the Climate Framework for Delaware, the report addresses concerns about climate-related threats to workers across state agencies, and offers recommendations related to policy development and implementation. The pilot team responsible for the report represented eleven different divisions across five state agencies - including the Department of Transportation, the Department of Health and Social Services, the Department of Natural Resources and Environmental Control, the Department of Safety and Homeland Security and the Office of Management and Budget.
Delaware Open Space Program	DNREC	It is the public policy of the State that the permanent protection of land shall be accomplished through the voluntary acquisition of interests or rights in land, or donation of said lands, and that said acquisition or donation constitutes a public purpose for which public funds have been expended or advanced and should be continued. Participation in the Open Space Program and all transactions to permanently protect land under this chapter shall be voluntary.
Conservation Easement Program	DNREC: Division of Parks & Recreation	A conservation easement is a voluntary agreement that allows a landowner to limit the type or amount of development on their property while retaining private ownership of the land.
Delaware's Forestland Preservation Program	Department of Agriculture	Delaware's Forestland Preservation Program protects forestlands through perpetual conservation easements. A conservation easement is a permanent deed restriction whereby the landowner still owns the property but certain activities, such as development, are prohibited.
CHAPTER 75. Delaware Land Protection Act	Office of the Governor	It is the public policy of the State that the permanent protection of land shall be accomplished through the voluntary acquisition of interests or rights in land, or donation of said lands, and that said acquisition or donation constitutes a public purpose for which public funds have been expended or advanced and should be continued.
Beach Preservation Act	DNREC: Division Watershed Stewardship	The Shoreline and Waterway Management Section is tasked with regulating coastal construction, depositing sand on beaches, planting beach grasses and installing sand fencing to promote the establishment of dunes.
Sediment and Erosion Control Act	DNREC: Division Watershed Stewardship	The Sediment Pollution Control Act (SPCA) of 1973 is a performance-oriented law. It was created to prevent pollution by sedimentation while still allowing development within our state. The SPCA is the enabling legislation that gives authority to the Sedimentation Control Commission (SCC) and the Land Quality Section (LQS) - Erosion and Sediment Control (E&SC) Program.
Dam Safety Program	DNREC: Division Watershed Stewardship	Provides the framework for proper design, construction, operation, maintenance, and inspection of dams in the interest of public health, safety, and welfare.
School Site Approval Process	Office of State Planning Coordination (OSPC)	All sites are reviewed prior to development of schools
The National Historic Preservation Act of 1966	Office of the Governor	The SHPO operates programs to identify, evaluate, and protect the State's archaeological sites, historic buildings, structures, and districts. In this capacity, the office is responsible for administering the federally mandated programs authorized under the National Historic Preservation Act of 1966.

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
State Historic Preservation Plan	Division of Historical and Cultural Affairs	Maintains the State Historic Preservation Plan. Delaware State Museum operates a system of eight public museums statewide and manages two State conference centers and seventeen leased or vacant historic properties.
Transportation Incident Event Management Plan	Division of Traffic Solution, Session: TMC – Transportation Management Center	The Transportation Incident Event Management Plan is used to manage State transportation systems during planned (e.g. civic events, beach traffic) and unplanned events (e.g. snowstorms, hurricanes.)
Executive Order 42	Office of the Governor	Authorizes the 2020 Delaware Strategies for State Policies and Spending.
2020 Delaware Strategies for State Policies and Spending	Office of State Planning Coordination (OSPC)	The continuing purpose of the Strategies for State Policies and Spending is to coordinate land-use decision-making with the provision of infrastructure and services in a manner that makes the best use of natural and fiscal resources. The importance of such coordination lies in the fact that land-use decisions are made at the local level, while the bulk of infrastructure (e.g., roads and schools) and services (e.g., emergency services and social services) that support land-use decisions are funded by the State.
22 Delaware Code §702: Comprehensive Development Plan	Office of State Planning Coordination (OSPC)	Requires Delaware municipal governments to develop and regularly update land use plans. Title 9 Chapters 2656 (New Castle, 4956 (Kent), and 6956 (Sussex)
The Preliminary Land Use Service (PLUS)	Office of State Planning Coordination	The PLUS process involves reviews by all applicable state agencies at the start of the land development process, adding value and knowledge to the process without taking over the authority of local governments to make land use decisions. Land use change proposals are submitted to state agencies through the Office of State Planning Coordination and are the subject of monthly PLUS meetings at which applicants meet with state agency resource experts to discuss their plans and identify possible problems, and solutions. Applicants are able to fully explain their projects to a group of planners representing all state agencies and to interact with those planners in a constructive dialogue. The streamlined process shortens state response time to more closely coordinate with local timelines. State comments are received in time to be of use and more completely reflect state and local land use plans and regulations.
THIRA/SPR	DEMA	The THIRA, included in the Delaware Strategic Plan 2019-2022, is the scenario tested by establishing the capabilities at the time of the examination, whether built or sustained. The Stakeholder Preparedness Review examines all 32 core capabilities, their funding, gaps, limitations, mutual aid, and the confidence to attend to that situation. Both can be used to determine growth in a study with feedback from FEMA in a "snapshot" based on their interpretation which provides a checks and balances.
SARA Title 3 (EPCRA)	DNREC	A form of information access, EPCRA is an opportunity for the public to make requests of what chemicals are stored at locations.
State Radiological Emergency Preparedness (REP) Program	Office of Radiation Control (ORC)	FEMA created the Radiological Emergency Preparedness (REP) Program to (1) ensure the health and safety of citizens living around commercial nuclear power plants would be adequately protected in the event of a nuclear power

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
		plant accident and (2) inform and educate the public about radiological emergency preparedness. Delaware's REP is included in the Delaware Strategic Plan 2019-2022. REP Program responsibilities cover only "offsite" activities, that is, state and local government emergency planning and preparedness activities that take place beyond the nuclear power plant boundaries. Onsite activities continue to be the responsibility of the NRC.
Distribution Management Plan	DEMA	The plan identifies how the state would provide commodities to citizens for large scale events where distribution is problematic. The plan also addresses strategies/plans for Defining Requirements; Resource Ordering; Distribution Methods; Inventory Management; Transportation; Staging; and Demobilization.
Hazardous Waste Contingency Plans DE Admin Code Title 7: 1302: Part 262: Section 262.260 to 262.265	DSHS & Facility Managers	The contingency plan must describe the actions facility personnel must take to comply with §§ 264.51 and 264.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.
House Bill 544	Office of the Governor	House Bill 544 of the 138th General Assembly was enacted to financially assist neighborhoods for heavy snow events. The bill excludes private roads (roads not yet approved for state maintenance) from the program. The bill further imposes price controls so that reimbursements do not exceed 75% of the amount paid to a plowing contractor or 75% of an annually adjusted formula based on state-maintained road miles within the suburban development.
National Pollutant Discharge Elimination System (NPDES)	DNREC	Delaware's Regulations Governing the Control of Water Pollution provide for a general permit under the National Pollutant Discharge Elimination System (NPDES) for controlling stormwater discharges from construction sites.
Economic Analysis of the Impacts of Climate Change in the State of Delaware	DNREC	The Economic Analysis is a tool to assist state agencies in completing cost/benefit analysis of proposed climate change adaptation actions. Providing assistance to state agencies as they plan for the impacts of climate change is a key strategy in the Climate Action Plan, and this analysis will assist state agencies toward that end. This report is not a comprehensive analysis of all possible climate impacts. The impacts chosen were derived from the 2014 Delaware Climate Impact Assessment and the 2013 Sea Level Rise Vulnerability Assessment. In total, 26 impact categories across 5 sectors were analyzed, including Natural Resources (DNREC), Human Health (DHSS), Transportation (DelDOT), Agriculture (DDA) and Human Safety (DSHS).
Federal-State Agreement (The agreement is executed between the Governor and FEMA Regional Director following a disaster in order to receive federal assistance);	Office of the Governor	Legislature from federal government.
The Robert T. Stafford Act of 1988 in accordance with 44 CFR 206.44;	Office of the Governor	Legislature from federal government.
Section 409 of Public Law 93-288, as amended by Public Law 100-707 (requirement to perform a state hazard mitigation plan following a presidential disaster declaration);	Office of the Governor	Legislature from federal government.
President's Executive Order 11988, Floodplain Management;	Office of the Governor	Legislature from federal government.

Planning and Regulatory Capability	Lead/ Responsible Organization	Description of Capability
President's Executive Order 11990, Protection of Wetlands	Office of the Governor	Legislature from federal government.
National Flood Insurance Act of 1968, as amended (42 USC 4001, et. seq.);	Office of the Governor	Legislature from federal government.
National Flood Insurance Act of 1968, as amended (42 USC 4001, et. seq.)	Office of the Governor	Legislature from federal government.
National Flood Insurance Program Implementing Regulations (24 CFR 46962), promulgated October 26, 1976	Office of the Governor	Legislature from federal government.
State Code 7-702; Quality of Life Act, Chapter 26 of State Code	Office of the Governor	Legislature from federal government.
The Governor's Emergency Operation Directive	Office of the Governor	Legislature from federal government.
The Robert T. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended	Office of the Governor	Legislature from federal government.
Title 44, CFR, Federal Emergency Management Agency Regulations, as amended	Office of the Governor	Legislature from federal government.
Emergency Management Act of 1981, Utah Code 53-2, 63-5.	Office of the Governor	Legislature from federal government.
Disaster Response Recovery Act, 63-5A.	Office of the Governor	Legislature from federal government.
Emergency Interim Succession Act, 63-5B.	Office of the Governor	Legislature from federal government.
State Disaster Recovery Redacted Account 53-2-403	Office of the Governor	Legislature from federal government.

Administrative and Technical Assessment

Administrative and technical capabilities include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
Staff- State Hazard Mitigation Officer	DEMA	The SHMO coordinates statewide hazard mitigation activities with technical support from State agencies through the State Hazard Mitigation Council. The SHMO oversees the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) Grant Program, the update and revision of the State Hazard Mitigation Plan and is the principle liaison in updating all the local mitigation plans.
Staff- Planner IV	DEMA	The Planner IV has been tasked with the coordination, development, and project management of mitigation projects for the SHMO.
Staff- Floodplain Administrator	DNREC	The State Floodplain Administrator is responsible for the oversight of statewide floodplain management duties, including the administration of the National Flood Insurance Program in the State of Delaware. The State Floodplain Administrator also manages the Flood Mitigation Assistance (FMA) Program. A concerted effort has been made to continue the close working relationship between DEMA and DNREC via the State and local hazard mitigation planning process.

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
Flood Mitigation Assistance (FMA) Program	DNREC	Provides project planning and technical assistance funding for flood mitigation projects to include acquisition, elevation and flood proofing of repetitive flood-prone properties.
Floodplain Management Program	DNREC	The Floodplain Management Program is responsible for the administrational oversight of the National Flood Insurance Program and the Flood Mitigation Assistance Program in the State of Delaware. The Programs are managed by the DNREC, Division of Watershed Stewardship, NFIP Coordinator, and the Flood Mitigation Assistance Administrator. Specific tasks include: 1) Assisting local governments administer and enforce their Local Flood Damage Prevention Ordinances, 2) Conducting regular training programs in order to educate local floodplain administrators on floodplain management techniques, and 3) Providing technical and program oversight of the Flood Mitigation Assistance Program.
Staff- Natural Hazards Planner	DEMA	Provides technical assistance to the counties on the drafting, review and approval of their mitigation plans.
Resilient Community Partnerships Program	DNREC: Delaware Coastal Programs	Delaware Coastal Programs provide technical support to local jurisdictions through its Resilient Community Partnerships program.
Natural Resources Police	DNREC	The Environmental Crimes Unit investigates violations of environmental laws. The unit focuses on unlawful releases of liquid, solid, and hazardous wastes and on air pollution violations. Fish and Wildlife Natural Resources Police investigate hunting, fishing, and boating violations. They patrol Delaware waterways, state wildlife areas, and state-owned boating access areas, fishing ponds and piers. Delaware's State Park Enforcement Officers patrol Delaware's state parks. They enforce park rules and regulations and help visitors with accidents, injuries, lost children and other problems.
Flood Planning Tool	DNREC	The DNREC Flood Planning Tool is an interactive web map application designed to aid you in researching your flood risk in the State of Delaware.
Delaware Coastal Zone Management Program	DNREC	A network of projects and programs designed to help manage coastal resources. Advises and assists local governments to develop programs and procedures for controlling erosion and sedimentation. Tasks include eliminating sediment that may limit stream flow.
Delaware FirstMap geospatial data portal	DNREC	FirstMap is a comprehensive self-service Enterprise Geographic Information System that consists of an enterprise geodatabase for data storage, an infrastructure to support geospatial and image services, and is tied into the State's ArcGIS Online portal for full self-service data discovery and mapping. It is designed to support the GIS needs of all state agencies, counties, municipalities, higher education, and the public.
Flood Insurance Rate Map (FIRM)	DNREC	Developed by FEMA, FIRMs are regulatory maps that show current flood risk areas, created using statistical data, hydrologic analysis, and historical flood information.
Delaware Coastal Inundation Maps	DNREC	DGS in cooperating with DNREC Delaware Coastal Programs, developed a series of coastal inundation maps corresponding to water surfaces from the mean higher-high water (MHHW) level to 7 feet about MHHW, in 1-foot increments. These were

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		generated in a bathtub-model using a LiDAR based 1-m DEM. These maps will help assess the potential impacts of sea-level rise, storm surges, and applications/
State Hazard Mitigation Program	DEMA	The State Hazard Mitigation Officer (SHMO) coordinates and administers the State's hazard mitigation program. In so doing, the SHMO coordinates with technical support agencies through the State Hazard Mitigation Council to ensure that the goals of the State Mitigation Plan are achieved. DEMA serves as the grantee for the Hazard Mitigation Grant Program, the Pre-Disaster Mitigation Program, Emergency Management Performance Grant, and several terrorism-related grant programs. This includes all fiscal administration and file management.
Shelter Strategy Work Group	DEMA	Delaware's Shelter Working Group meets quarterly to evaluate shelter requirements, catalogue available resources, anticipate shortcoming, and make decisions to effect shelter program improvements. The Group consist of key State and local agencies and non-profits.
State Fire School	Fire Prevention Commission	Offers wildfire and HazMat courses, as well as ice, water, and other natural hazard rescue classes.
Disaster Research Center (DRC)	University of Delaware System	The Center conducts field and survey research on group, organizational, and community preparation for, response to, and recovery from natural and technological disasters and other community-wide crises. DRC researchers have carried out systematic studies on a broad range of disaster types, including hurricanes, floods, earthquakes, tornados, hazardous chemical incidents, and plane crashes. DRC has also done research on civil disturbances and riots, including the 1992 Los Angeles unrest. Staff has conducted nearly 600 field studies since the Center's inception, traveling to communities throughout the United States and a number of foreign countries, including Mexico, Canada, Japan, Italy, and Turkey.
Delaware Climate Office	University of Delaware System- CEMA	The Delaware Climate Office, led by the Delaware State Climatologist, serves as the primary source of historical information and guidance on the effects of weather-related phenomena on the State of Delaware. This includes guidance on appropriate mitigation factors with respect to the hazards that face the State.
Delaware Weather Hazard Index	University of Delaware – CEMA	The Delaware Weather Hazard Index incorporates data from the National Digital Forecast Database (NDFD) and the Delaware Bay Operational Forecast System (DBOFS) to visually represent the severity of meteorological hazards across Delaware and regions nearby.
The Preliminary Land Use Service (PLUS)	Office of State Planning Coordination	The PLUS process involves reviews by all applicable state agencies at the start of the land development process, adding value and knowledge to the process without taking over the authority of local governments to make land use decisions. Land use change proposals are submitted to state agencies through the Office of State Planning Coordination and are the subject of monthly PLUS meetings at which applicants meet with state agency resource experts to discuss their plans and identify possible problems, and solutions. Applicants are able to fully explain their projects to a group of planners representing all state agencies and to interact with those planners in a constructive dialogue. The streamlined process shortens state response time to more closely

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		coordinate with local timelines. State comments are received in time to be of use and more completely reflect state and local land use plans and regulations.
Delaware Coastal Management Program	DNREC: Delaware Coastal Programs	Delaware Coastal Management is a collection of programs and projects within the Delaware DNREC, designed to manage the State's shoreline, coastal zone and navigable waterways. Among the various programs that directly impact coastal issues include: the Delaware Riparian Buffer Initiative, Delaware National Estuarine Research Reserve, and the Sediment and Stormwater Program.
NFIP	DNREC	Contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. In order for a county or municipality to join the NFIP, they must adopt a Local Flood Damage Prevention Ordinance.
Coastal Training Program	DNREC: Delaware Coastal Programs	The Coastal Training Program offers technical assistance, seminars, hands-on skill training, and participatory workshops to lectures and technology demonstrations for local governments and planners.
Staff- SHPO	Division of Historical and Cultural Affairs	The SHPO operates programs to identify, evaluate, and protect the State's archaeological sites, historic buildings, structures, and districts. In this capacity, the office is responsible for administering the federally mandated programs authorized under the National Historic Preservation Act of 1966.
FirstNet Partnership	ATT/DEMA/SIRC	The FirstNet mission is to deploy, operate, maintain, and improve the first high-speed, nationwide wireless broadband network dedicated to public safety. This reliable, highly secure, interoperable, and innovative public safety communications platform will bring 21st century tools to public safety agencies and first responders, allowing them to get more information quickly and helping them to make faster and better decisions.
LEPC	EPA/DSHS/DNREC/DEMA	A Local Emergency Planning Committee (LEPC) is a legally mandated organization that is established in an Emergency Planning District designated by the State Emergency Response Commission (SERC).
Housing Portfolio Risk Analysis	DSHA	The analysis helped DSHA create a list of building resilience action items to be included in Low Income Housing Tax Credit program for preservation projects and changes in DSHA construction and design standards to mitigate future resiliency issues for affordable housing.
Delaware Environmental Observing System (DEOS)	CEMA	The Delaware Environmental Observing System is a real-time environmental monitoring network for the State of Delaware. The system also provides notifications about adverse conditions to state and local officials during significant weather events. DEOS real-time snow data supports DelDOT as well as pond/lake water level data to support the state's Dam Safety program.
Delaware Geological Survey (DGS)	UD	Conducts geologic and hydrologic research, service, and exploration for the benefit of the citizens of Delaware. Maintain earthquake sensing data, weather reporting calls for the state. Cover most of the flooding discussions for street and coastal areas. Coordinating the LiDAR for the State.
Center for Applied Demography and Survey Research (CADSR)	UD	The Center for Applied Demography and Survey Research (CADSR) provides opinion research and statistical analysis in areas such as health and transportation policy as well as general demographic analysis for state and local government and the private sector.
University of Delaware Water Resources Center (DWRC)	UD	Supports research, education, and public outreach programs that focus on water supply, water management, and water quality. Fosters and supports training and

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		education programs for the future water scientists, engineers, managers, and policymakers who will lead the water resources research, planning, and management efforts in our state in the future.
Grant Assistance Program (GAP)	University of Delaware Institute for Public Administration	Provides free technical grant assistance to local governments for infrastructure initiatives and other competitive and formula grant opportunities.
Coastal Resilience Design Studio	Delaware Sea Grant	Free community engagement, technical assistance, and landscape design culminating in conceptional designs for green infrastructure projects, sustainable land use plans, and other strategies that improve economic and coastal resilience.
Resilient and Sustainable Communities League (RASCL)	(This is a network - no one agency in charge.) Leadership team is Delaware Coastal Programs, Delaware Sea Grant, Partnership for the Delaware Estuary, Office of State Planning & Coordination, DelDOT	Resilient, sustainable communities are the backbone of a thriving state. The member organizations of RASCL are committed to working together to provide technical expertise and support to Delaware communities in order to increase their capacity to adapt, mitigate, and respond to environmental changes, including climate change. The RASCL Project Guidance Group serves as a sounding board to local communities by advising them on how to navigate funding, permitting, and other hurdles when initiating or implementing a project.
Delaware Coastal Flood Monitoring System (CFMS)	DEOS & DGS	The Delaware Coastal Flood Monitoring System (CFMS) has been developed, jointly by the Delaware Geological Survey (DGS) and the Delaware Environmental Observing System (DEOS) at the University of Delaware, to achieve such a goal. A prototype of the system was released in the summer of 2011 for a limited number of Kent County communities along the Delaware Bay but has since expanded to include coastal areas from the City of New Castle southward to the City of Lewes (i.e., areas within the coastal plain of Delaware where flood risk is dominated by tidal fluctuations, wind-driven storm surge and waves.) The current version of the CFMS includes the coastal communities from the City of New Castle down to the City of Lewes. There were 15 communities identified in this area, approximately one location for every 3 miles of coastline. Each community is listed on the CFMS home page with its maximum forecasted water level as well as a community map page with 48-hours tidal forecasts and road elevation profiles.
Delaware Irrigation Management System (DIMS)	UD	DIMS uses an irrigation scheduling method based on the basic water balance. Output from evapotranspiration is calculated and tracked and compared to inputs from rainfall and irrigation to determine the amount of water available in the soil to a particular crop. DIMS utilizes the method described in FAO Irrigation and Drainage Paper No. 56, Crop Evapotranspiration Guidelines for Computing Crop Water Requirements.
Delaware Water Quality Portal	DNREC	This site provides water quality data collected by the Delaware Department of Natural Resources and Environmental Control (DNREC) Surface Water Quality Monitoring Program, DNREC Recreational Water Program, Delaware River Basin Commission Boat Run Program (operated by DNREC), and the University of Delaware's Citizen Monitoring Program. This site is intended to provide general access to water quality data observed in Delaware's waterways since 2000. Features of this site include a map interface of all water quality monitoring sites,

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		graphs of water quality data, historical data files, and a water quality conditions search tool.
General Assessment Monitoring Network (GAMN)	DNREC	As part of its Surface Monitoring Program, DNREC maintains a General Assessment Monitoring Network (GAMN) of about 140 stations. GAMN stations are considered long term stations whose data is used to: - Describe general water quality conditions of the State's surface waters; Identify long term trends in water quality; - Determine the suitability of Delaware waters for water supply, recreation, fish and aquatic life, and other uses; - Calculate annual nutrient loads and track progress toward achieving Total Maximum Daily Loads (TMDLs) targets; and - Evaluate the overall success of Delaware's water quality management efforts. Monitoring frequency at GAMN stations follows a 5-year rotating basin schedule in which every station is monitored monthly for 2 years and monitored every other month for the remaining 3 years. Each station is monitored for conventional parameters such as nutrients, bacteria, dissolved oxygen, pH, alkalinity, and hardness. Some stations are also monitored for dissolved metals.
DNREC Surface Water Quality Monitoring Program	DNREC	The DNREC Surface Water Quality Monitoring Program collects data on the chemical, physical, and biological characteristics of Delaware's surface waters and consists of seven major components: - General Assessment Monitoring - Chesapeake Non-tidal Monitoring - Continuous Water Quality Monitoring - Biological Assessment Monitoring - Toxics in Biota Monitoring - Toxics in Sediment Monitoring - Monitoring under the Watershed Approach to Toxics Assessment and Restoration (WATAR) Plan.
Snow Monitoring Network	DEOS	The snow monitoring stations directly measure snow depth, which is processed every five minutes to produce snow accumulation data. Snow depth is measured using a sonic ranging depth sensor. The accuracy of this sensor is +/- 1 cm (approximately 0.3937 in.). Each snow depth measurement undergoes a quality control procedure that checks for instrumentation error and data integrity according to the manufacturer's recommendations.
Center for Environmental Monitoring & Analysis (CEMA)	UD	The Center for Environmental Monitoring Analysis (CEMA) was formed in 2017 to streamline support for several programs at the University of Delaware that focused on monitoring the environment and developing applications to aid decision making and improve Delaware's ability to respond to extreme weather and climate events. programs. CEMA, located in the College of Earth, Ocean, and Environment (CEOE) at the University of Delaware, combines the following programs under one banner: - The Office of Delaware State Climatologist (est. 1977) - The Delaware Environmental Observing System (est. 2003) - The Delaware Environmental Monitoring and Analysis Center (est. 2010)

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		- The University of Delaware Satellite Receiving Station (est. 2011) CEMA's mission consists of the following six (6) core focus areas: 1. Operate and maintain a network of real-time environmental sensing stations in support of emergency management, natural resource management, transportation, and agriculture. 2. Operate a series of internet resources to provide real-time and historical environmental data for Delaware. 3. Engineer environmental data products and monitoring solutions in support of emergency management, natural resource management, transportation, and agriculture. 4. Provide weather and climate expertise to the State in support of its operational mission during inclement weather events as well as planning support for weather and climate-related issues. 5. Provide regular weather and climate reports as well as special reports on extreme weather events affecting Delaware. 6. Collaborate with other researchers and institutions to enhance the research community's understanding of weather and climate-related issues, particularly as they relate to Delaware.
Climate Risk Analysis and Resiliency Assessment (RARA)	DSHA	The 2019 RARA was the first-in-the-nation, comprehensive Climate analysis and assessment of a portfolio of 215 state-assisted affordable multifamily properties and its agency policies and practices to enhance the climate resiliency of the State of Delaware. It helped DSHA create a list of building resilience action items to be included in Low Income Housing Tax Credit (LIHTC) Program for preservation projects and changes in DSHA construction and design standards to mitigate future resiliency issues for affordable housing. The Resiliency Assessment provides recommendations and strategies to design and rehab and/or address current or future resilience issues. Examples include: • Dry Floodproofing (Building) • Backwater Valves • Component Protection Floodproofing • Elevated Equipment • Maintaining Backup Power to Critical Systems • Develop Emergency Management Manual • Properly Vent or Eliminate Combustion Appliances
Resilience Assessment Tool	DSHA	DSHA developed an Excel-based Resilience Assessment Tool for property owners, managers and design professionals to identify risks and resilience opportunities for multifamily affordable housing in Delaware. This tool identifies hazards, vulnerabilities and high priority resilience strategies based on key site and building characteristics. Additionally, the team worked with DSHA's Asset Management and Construction staff to develop a Resilience Checklist to enhance DSHA's annual property inspection process.
Delaware Coastal Management Assistance Program	DNREC	Delaware's Coastal Management Assistance Program improves local capacity to conserve and manage coastal resources and supports the integration of coastal management principals through local planning and implementation activities. The program provides special area management planning, assistance to state and local

Administrative and Technical Capability	Lead/ Responsible Organization	Description of Capability
		governments for local land use planning and offers technical assistance to communities.
Delaware 2017 Coastal Inundation Maps	DNREC	Delaware's Department of Natural Resources and Environmental Control (DNREC) and the scientists from Delaware Coastal Programs have developed Sea Level Rise (SLR) inundation maps for the state as an online interactive tool. The maps show the possible impacts of inundation based on various SLR scenarios for Delaware's waterways and watersheds.
Delaware Sea Level Rise Advisory Committee	DNREC	The Delaware Sea Level Rise Advisory Committee was created in 2010 to bring together to investigate the state's vulnerability to sea level rise and to provide recommendations about how to best prepare for higher sea levels.
Wildland Fire Program	Department of Agriculture	The Wildland Fire Program encompasses the Delaware Forest Service to minimize damage from wildland fire through prevention and suppression activities.

Financial Assessment

Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.

Financial Capability	Lead/ Responsible Organization	Description of Capability
Grants Management	Various	Departments apply for and manage various grants, including grants for mitigation actions.
Locally based revenue	Various	Local revenue collected in the counties and jurisdictions help fund state-sponsored activities, such as road maintenance.
Acquisition funding programs	Various	State has capability to acquire properties and land.
Operating budgets	Various	Budgets can be tied to mitigation-related activities.
Community Development Block Grant (CDBG) Program	DSHA	The CDBG Program provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons.
Planning grants (e.g., coastal resilience, fire management, stream corridor protection)	Various	Planning grants are designed to fund the development of various plans.
FEMA grant programs (including HMA)	DEMA	FEMA's hazard mitigation assistance provides funding for eligible mitigation measures that reduce disaster losses.
Federal agency programs (e.g., USACE, Environmental Protection Agency)	Various	Federal partners provide various funding opportunities for State departments to apply for.
50/50 Cost Share Program	DFS	DFS provides a 50/50 cost share program to volunteer fire companies for wildland firefighting equipment annually.
Phragmite mitigation funding	DFS	DFS provides funding for the mitigation of phragmites. This program is offered annually and is to be used near structures to reduce the nature fuels and wildfire threat. Accomplished by chemically or mechanically removing vegetation. For 2017, over $22,000 was provided to communities for this work. By partnering with DNREC Fish and Wildlife, over 6700 acres were treated in the first state.

Financial Capability	Lead/ Responsible Organization	Description of Capability
The Strategic Opportunity Fund for Adaptation	DNREC: Division of Energy and Climate	The Strategic Opportunity Fund for Adaptation is a competitive grant program to support State agencies' progress toward implementing actions that will strengthen the State's preparedness and ability to adapt to current and future effects of climate change.
Realty Transfer Tax for Conservation Fund	Department of Finance	House Bill 192: Provides funding to implement the conservation program described in 65 Del. Laws, c. 212.
State Revolving Loan Program	Department of Finance	Counties and municipalities can borrow funds to offset cost share requirements of federally funded mitigation projects.
Strategic Opportunity Fund for Adaptation (SOFA)	DNREC: Division of Energy and Climate	Intended to support state agencies' progress toward implementing actions that will strengthen the state's preparedness and ability to adapt to current and future effects of climate change.
Port Security Grant Program	AMSC	This grant provides funding to state, local and private-sector partners to help protect critical port infrastructure from terrorism, enhance maritime domain awareness, improve port-wide maritime security risk management, and maintain or reestablish maritime security mitigation protocols that support port recovery and resiliency capabilities.
Homeland Security Grant Program (HSGP)	DEMA	The Homeland Security Grant includes a suite of risk-based grants to assist state, local, tribal and territorial efforts in preventing, protecting against, mitigating, responding to and recovering from acts of terrorism and other threats. This grant provides grantees with the resources required for implementation of the National Preparedness System and working toward the National Preparedness Goal of a secure and resilient nation.
Nonprofit Security Grant Program (NSGP)	DEMA	The NSGP provides funding support for target hardening and other physical security enhancements and activities to nonprofit organizations that are at high risk of terrorist attack. The intent is to integrate nonprofit preparedness activities with broader state and local preparedness efforts.
State and Local Cybersecurity Grant Program	DEMA	The State and Local Cybersecurity Grant Program provides funding to eligible entities to address cybersecurity risks and cybersecurity threats to information systems owned or operated by, or on behalf of, state, local, or tribal governments.
HMEP	DEMA	Used only for preparedness, planning and training related to hazmat.
Funded Research	Delaware Sea Grant	Funds research proposals that may inform hazard mitigation (not always yearly).
Maintain funding database	RASCL	The database contains grants and other funding sources related to resilience and sustainability. It has filters that enable communities and others to search and sort funding opportunities.
Snow Removal Reimbursement Program	DelDOT	As a result of the extreme 1995-1996 snow season which put a great hardship on civic associations' budgets House Bill 544 of the 138th General Assembly was enacted to financially assist these neighborhoods for heavy snow events. The bill excludes private roads (roads not yet approved for state maintenance) from the program. The bill further imposes price controls so that reimbursements do not exceed 75% of the amount paid to a plowing contractor or 75% of an annually adjusted formula based on state-maintained road miles within the suburban development.
Delaware Database for Funding Resilient Communities	University of Delaware	The Institute for Public Administration at the University of Delaware, with support from Delaware Coastal Programs, has compiled a web-based database of financial assistance programs that can support Delaware's local governments with the implementation of climate change adaptation and resilient community development.
Emergency Solutions Grant (ESG)	DSHA- HUD	The purpose of the ESG program is to assist individuals and families quickly regain stability in permanent housing after experiencing a housing crisis or homelessness.
Low Income Housing Tax Credit (LIHTC) program	DSHA	The LIHTC was created in 1986 to encourage a private/public investment to preserve and construct new affordable rental housing. DSHA uses the LIHTC program as a key program for partnering with other state agencies to meet shared goals. For example, DSHA collaborate with the Delaware Transit Corporation (DTC) to facilitate the development of affordable rental housing near existing or planned transit stops to meet the shared goal of assisting working families most likely to benefit from proximity to transit as well as increase ridership for DTC. The equity raised through the tax credit investment makes it possible for developers to attract the financing needed to create or restore low-income rental housing.

Education and Outreach Assessment

Education and outreach programs and methods can be used to implement mitigation activities and communicate hazard-related information.

Capability	Lead/ Responsible Organization	Description of Capability
Fire Prevention and Protection Program	Department of Agriculture- Delaware Forest Service	This program operates directly through the DFS Urban and Community Forestry Program and provides technical and financial assistance to homeowners' associations, municipalities, counties, and state government agencies on tree care and hazard mitigation.
Consumer services website	Department of Insurance	Discusses flood insurance, including why it should be purchased, what to do if you experience weather-related damages, and how it can be purchased.
Delaware Accidental Release Prevention Program	DNREC	The program led to the creation of a system that allows citizens to promptly learn of releases or discharges of contaminants or pollutants that meet or exceed certain thresholds. Following the receipt of a discharge or release report, DNREC notifies the public within 12 hours. The program was developed in response to Senate Bill 33 that was passed in July 2001. The program's mission is "protecting the lives and health of persons living and working in the vicinity of facilities handling extremely hazardous substances." The program, based on the Clean Air Act, Section 112r, requires that owners and operators of stationary sources that maintain regulated substances on site must develop and implement a risk management program that anticipates and minimizes the chances of catastrophic events.
Citizen Corps	DEMA	The mission of Citizen Corps is to harness the power of every individual through education, training, and volunteer service to make communities safer, stronger, and better prepared to respond to the threats of terrorism, crime, public health issues, and disasters of all kinds.
Community Rating System	DNREC	The primary goals of the CRS are to reduce flood losses, facilitate accurate insurance ratings, and to promote the awareness of flood insurance. These goals are achieved through the administration of a program that goes beyond the requirements of NFIP participation. The CRS is an incentive-based program that encourages counties and municipalities to undertake defined actions designed to reduce the impacts of future flooding.
DC CAER (Delaware City Community Awareness and Emergency Response) group	DSHS	DC-CAER is an informal organization made up of representatives of all the chemical facilities in the Delaware City Refinery complex, NCC OEM, DEMA, DNREC, and DSP. Formed voluntarily in 1985, DC-CAER strives to meet three goals: to enhance emergency response capabilities, to test and evaluate these capabilities, and to foster knowledge about chemical-related hazards and protective measures. DC-CAER maintains a comprehensive emergency response plan, known as the DC-CAER Plan, to deal with chemical emergencies at the plant; conducts training programs for emergency responders; coordinates annual field emergency response exercises and tabletop drills; conducts community outreach programs to disseminate emergency information; makes presentations about its programs to community, government, and professional organizations throughout Delaware and in other States.
Annual Summit and Coffee Hours	RASCL	An annual summit and quarterly coffee hours to promote information sharing, networking, and disseminate best practices.
"News Digest" newsletter	RASCL	RASCL issues a newsletter periodically with links to resources, program announcements, and information on best practices for resilience, sustainability, and hazard mitigation.

Capability	Lead/ Responsible Organization	Description of Capability
Coast Day	College of Earth Ocean and Environment	Annual outreach event, that features lectures and exhibits that relate to earth sciences and hazard information.
Preparedness Workshops	Delaware Sea Grant	Emergency preparedness workshops for vulnerable populations (including the deaf and older adults).
Cape Community Coalition (CCC)	Delaware Sea Grant	Local resilience network in eastern Sussex County that activates when there is a crisis. CCC leverages help and resources within the network to address gaps related to food, housing, equipment, or other needs during a crisis.
Weather Awareness Weeks: www.climate.udel.edu	CEMA	Work with DEMA and Delaware Sea Grant severe weather awareness week, and hurricane awareness, winter weather awareness. State climate office and National weather service. Presentations around the state on severe weather and hazards Monthly summary weather reports and climate updates for the state and maintain the states data base for the state's climate.
Delaware Environmental Monitoring Coordination Council (DEMCC) Annual Symposium	DEMCC	A gathering of environmental partners from around the state to promote best practices in environmental monitoring and coordinate monitoring around the state of Delaware. These gatherings offer an opportunity to learn about the current state of environmental monitoring activities in Delaware, discuss upcoming challenges, and explore opportunities to collaborate on future monitoring campaigns.
Delaware Weather Hazard Index	CEMA	Reflects 48-hour potential threats & weather conditions.
All Ready Delaware	University of Delaware Center for Disability Studies	This website will help the disabled population think through personal needs in an emergency, and how to plan ahead for various situations. It will suggest action steps to develop a personal preparedness plan.
University of Delaware's Citizen Monitoring Program	University of Delaware Sea Grant Marine Advisory Service	Established in 1991, the University of Delaware's Citizen Monitoring Program collects verifiable water quality data to support public policy decisions and to increase public participation and support for the management and protection of the Inland Bays. Today, the program includes the original Inland Bays Citizen Monitoring Program, the Broadkill River Monitoring Program, the Harmful Algae Monitoring Program, and the Bacteria Monitoring Program. The program is managed by the University of Delaware Sea Grant Marine Advisory Service at the College of Earth, Ocean, and Environment in Lewes. Support for the program comes from many sources including: Sea Grant; DNREC; the Center for the Inland Bays; U.S. Environmental Protection Agency; the Delaware Estuary Program; the National Fish and Wildlife Foundation and local communities.
Delaware Housing Search (DHS)	DSHA	Housing search that all counties and state agencies contribute funds to. Updated in 2019, DHS is an online housing locator service supported by a partnership of nonprofit and government organizations. DHS maintains over a quarter of Delaware's entire rental housing stock and is accessible online and via a toll-free bi-lingual call-center.

These capabilities can be expanded by implementing actions that can expand and improve existing authorities, plans, policies, and resources for mitigation, to include budgeting and passing policies and procedures for mitigation actions, adopting and implementing stricter mitigation regulations, approving the hiring and training of staff for mitigation activities, and approving mitigation updates to existing plans as new needs are recognized.

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Appendix C. Adoption & Assurances

The State Hazard Mitigation Plan (SHMP) has received FEMA's “Approvable Pending Adoption" and with the attached acceptance authorized in the next letter, this document becomes legal binding and authoized by the Governor of the State of Delaware.

After FEMA has determined that all plan requirements have been met, including receipt of the formal adoption documentation, FEMA will provide a letter indicating the plan is approved. A copy of the adoption resolution and approval letter are included in this appendix.

The State of Delaware will update the plan whenever necessary to reflect changes in state or federal laws and statutes and will manage and administer FEMA funding in accordance with applicable federal statutes and regulations.

Delaware Emergency Management Agency

STATE OF DELAWARE | DEPARTMENT OF SAFETY AND HOMELAND SECURITY

ADDRESS

165 Brick Store Landing Road
Smyrna, Delaware 19977

PHONE

302-659-DEMA (3362)

STAY CONNECTED

DelawareEMA

TO: Heads of all State Departments, Offices and Agencies Executive Heads of County and City Governments and Citizens of the State of Delaware

The State of Delaware has met all plan adoption requirements pursuant to the Disaster Mitigation Act of 2000. Evidence of Plan adoption is represented by the executed resolution, signed by the Director of the Delaware Emergency Management Agency, the Secretary of Safety and Homeland Security, and the Governor of the State of Delaware.

The Plan has been formally adopted by the State prior to submittal to the Federal Emergency Management Agency (FEMA) for final review and approval, including assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 13.11(c). The State will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 13.11(d).

Attached is the updated State of Delaware Hazard Mitigation Plan, dated July 2023. It will be used for mitigation planning purposes and establishes the State of Delaware as a Disaster Resilient State through a comprehensive mitigation program against natural and non-natural hazards, including acts of terrorism. It establishes authorization and Coordination procedures to better protect the lives and property of the people of this State.

7/17/23

A.J. Schall — Date
Director,
Delaware Emergency Management Agency

0718/2023

Nathaniel McQueen

Nathaniel McQueen — Date
Secretary,
Department of Safety and Homeland Security

John Carney — Date
The Governor of Delaware