

## Hazard Identification and Risk Assessment

As part of the plan update process, a Hazard Identification Risk Assessment (HIRA) has been completed for Wicomico County, Maryland. Results from the Hazard Risk Survey completed by Stakeholders have been integrated into the updated HIRA.

A **risk** is the chance, high or low, that any hazard will occur and the severity or impact from that hazard.

Twelve (12) natural hazards have been identified and a hazard risk has been assigned to each. Only natural hazards are included in this assessment as they lend themselves better to data collection related to geographic extent than technological and man-made hazards. A separate risk assessment will be conducted for the technological and man-made hazards (i.e., transportation accident, hazardous material incident, dam failure, fire and explosion, mass power outage) identified in the previous plan version.

Natural Hazard Identification and Risk Assessment Ranking Results			
Hazards	2016 Hazard Ranking	2021 Hazard Ranking	2021 Composite Score
<b>*Flood (Flash/Heavy Rain)</b>	<b>Medium</b>	Medium-High	20.5
<b>Drought</b>	<b>Medium</b>	<b>Medium</b>	17
<b>Tornado</b>	<b>Medium</b>	<b>Medium-Low</b>	13
<b>Thunderstorm</b>	<b>Medium</b>	<b>High</b>	26
<b>High Wind</b>	<b>Medium-High</b>	<b>Medium</b>	19
<b>Wildfire</b>	<b>Medium</b>	<b>Medium</b>	18
<b>Earthquake</b>	<b>Low</b>	<b>Medium-Low</b>	9
<b>Extreme Cold – Cold/Wind Chill</b>	<b>Medium</b>	<b>Medium-Low</b>	14.5
<b>Winter Storm</b>	<b>Medium-High</b>	<b>Medium-Low</b>	14.5
<b>Extreme Heat</b>	<b>Medium</b>	<b>Medium</b>	15.5
<b>Coastal Storm and Flooding</b>	<b>Medium-High</b>	<b>Medium-High</b>	22
<b>Pandemic and Emerging Infectious Diseases</b>	<b>No 2016 Ranking</b>	<b>High</b>	28
*This hazard was identified as “Flood (Riverine & Flash)” in the 2016 Plan Update.			

The methodology and data used to complete this HIRA has been included on the following pages, which will comprise Appendix A of the Plan Update.

## Hazard Identification and Assessment (HIRA) Methodology

To assess the hazard risk for the twelve (12) natural hazards identified in this Plan Update a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), Maryland Department of Health - Maryland's NEDSS And PRISM Databases, stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability, and;
- Community perspective.

The following eight (8) ranking parameters were used to develop the composite risk score, which provide the hazard ranking results for the twelve (12) identified natural hazards. Each parameter was rated on a scale of one (1) to four (4).

### Injuries and Death Ranking

<b>Death</b>	4
<b>N/A</b>	3
<b>Injury</b>	2
<b>None</b>	1

Source: National Centers for Environmental Information

### Annualized Events Ranking

<b>2.51</b>	4
<b>1.01</b>	3
<b>0.11</b>	2
<b>0</b>	1

Source: National Centers for Environmental Information, Maryland Dept. of Health – Maryland’s NEDSS and PRISM Databases

### Community Perspective Ranking

<b>Very Concerned</b>	4
<b>Concerned</b>	3
<b>Somewhat Concerned</b>	2
<b>Not Concerned</b>	1

Source: Wicomico County Hazard Mitigation Plan Update: Public Survey

### Property and Crop Damage Ranking

<b>&gt; 2M</b>	4
<b>501K</b>	3
<b>50k</b>	2
<b>0</b>	1

Source: National Centers for Environmental Information

### Probability and Future Ranking

<b>Highly Likely</b>	4
<b>Likely</b>	3
<b>Occasional</b>	2
<b>Unlikely</b>	1

Source: National Centers for Environmental Information, based upon annualized events

Max Geographical Extent (Hazard Dependent) Ranking								
Ranking	Coastal & Climate Change	Drought	Flood	Thunderstorm	Tornado & Earthquake	Wildfire	Wind	Winter Storm
1	0.00	0	0.00	0-2 events	0-10 events	0	0.00	10"-19"
2	25.00	0.18	10.00	3-5 events	11-17 events	0.4674	60.00	20"-29"
3	50.00	0.3421	20.00	6-8 events	18-22 events	2.1545	74.00	30"-39"
4	75.00	0.49	30.00	>9 events	>23 event	3.9041	95.00	>40"
<i>Source:</i>	<i>COASTAL: Risk Area</i>	<i>DROUGHT: CDL MD</i>	<i>FLOOD: DFIRMS</i>	<i>THUNDERSTORM: NCDC</i>	<i>TORNADO: NCDC EARTHQUAKE: Maryland Geological Survey</i>	<i>WILDFIRE: MD DNR Forest Service</i>	<i>WIND: ASCE</i>	<i>WINTER STORM: National Weather Service</i>
Calculated Using:	% of Coastal Land Area	% Crop Area	% Area in 100-yr Floodplain	Average number based on: Number of events, 2" > hail and lightning events with Injuries/Deaths	Sum of all tornados weighted by F-scale (F1*1.5, F2*2, F3*3, F4*4); Number of Earthquake Events	Average annual acres burned (%)	ASCE Design Wind Speeds	Average Snowfall
<i>Source: 2016 State of Maryland Hazard Mitigation Plan</i>								

The following weighted risk factors were used in the equation below to determine the composite risk score for each identified hazard.

Weighted Risk Factors		
Injuries	IN	1
Deaths	DT	1
Property Damage	PD	1
Crop Damage	CD	1
Geographic Extent (Hazard Dependent)	GE	1.5
Events (Annualized)	EV	1
Future Probability	FP	1
Community Perspective	CP	1.5

**Equation:** Composite Score = IN + DT + PD + CD + (GE\*1.5) + EV + FP + (CP\*1.5)

**Hazard Ranking Results:** Using the data tables above to populate the parameters, the composite score was determined for each identified hazard. Hazard Rankings were assigned accordingly using the adjacent Composite Score chart.

Composite Score	
Score (>=)	Hazard Ranking
0	Medium-Low
15	Medium
20	Medium-High
25	High

The following table provides the hazard risk ranking update results. Thunderstorm and Pandemic and Emerging Infectious Diseases were ranked as “High” risk hazards. Flood and Coastal Storm and Flooding were ranked as “Medium-High” risk hazards. Drought, High Winds, Wildfire, and Extreme Heat were ranked as “Medium” risk hazards. Finally, Tornado, Earthquake, Winter Storm, and Extreme Cold were ranked as “Medium-Low” risk hazards.

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**Composite Scores**

Hazard	Injuries & Deaths		Property & Crop Damage		Geographic Extent	Total Events Annualized	Future Probability	Community Perspective	Composite Score	HAZARD RANKING
	IN	DT	PD	CD	GE	EV	FP	CP	CS	
<b>Flood</b> (Flash Flood, Heavy Rain)	0 = 1	0 = 1	\$70k = 2	0 = 1	18.23% = 3	0.93 = 2	Likely = 3	Very Concerned = 4	20.5	<b>Medium-High</b>
<b>Drought</b>	0 = 1	0 = 1	0 = 1	4.2M = 4	37% = 3	1.3 = 2	Occasional = 2	Not Concerned = 1	17	<b>Medium</b>
<b>Tornado</b>	2 = 2	0 = 1	\$1.163 M = 3	0 = 1	8 = 1	0.14 = 2	Unlikely = 1	Not Concerned = 1	13	<b>Medium-Low</b>
<b>Thunderstorm</b> (Thunderstorm Wind, Lightning, Hail)	1 = 2	1 = 4	\$473k = 2	0 = 1	122 = 4	0.71 = 2	Likely = 3	Very Concerned = 4	26	<b>High</b>
<b>High Winds</b>	0 = 1	0 = 1	\$1.049 M = 3	0 = 1	120 = 4	0.41 = 2	Occasional = 2	Somewhat Concerned = 2	19	<b>Medium</b>
<b>Wildfire</b>	1 = 2	1 = 4	0 = 1	0 = 1	0.012% = 1	29.13 = 4	Likely = 3	Not Concerned = 1	18	<b>Medium</b>
<b>Earthquake</b>	0 = 1	0 = 1	0 = 1	0 = 1	1 = 1	0.01 = 1	Unlikely = 1	Not Concerned = 1	9	<b>Medium-Low</b>
<b>Extreme Heat</b>	0 = 1	0 = 1	0 = 1	0 = 1	4	0.30 = 2	Occasional = 2	Not Concerned = 1	15.5	<b>Medium</b>
<b>Winter Storm</b> (Winter Weather)	0 = 1	0 = 1	0 = 1	0 = 1	7" = 1	1.48 = 3	Likely = 3	Somewhat Concerned = 2	14.5	<b>Medium-Low</b>

**Composite Scores**

Hazard	Injuries & Deaths		Property & Crop Damage		Geographic Extent	Total Events Annualized	Future Probability	Community Perspective	Composite Score	HAZARD RANKING
<b>Extreme Cold – Cold/Wind Chill</b>	0 = 1	0 = 1	0 = 1	0 = 1	4	1	Unlikely = 1	Not Concerned = 1	13.5	<b>Medium-Low</b>
<b>Coastal Storm and Flooding</b> (Tropical storm, Hurricane, Coastal Flooding)	0 = 1	0 = 1	\$4.828 M = 4	\$1.06 M = 3	49% = 3	0.27 = 2	Occasional = 2	Somewhat Concerned = 3	22	<b>Medium-High</b>
<b>Pandemic and Emerging Infectious Diseases</b>	*6,543 = 2	*135 = 4	0 = 1	0 = 1	**100% = 4	***1,348.4 annual cases = 4	Highly Likely = 4	Very Concerned = 4	28	<b>High</b>

\*Injuries & Deaths were based on Coronavirus Disease 2019 (COVID-19) Outbreak data provided by Maryland Department of Health as of February 9, 2021.

\*\*Pandemic & Emerging Infectious Diseases’ geographic extent is countywide (100%).

\*\*\* Total Events/Annualized based on Cases of Selected Notifiable Conditions Reported Wicomico County, Maryland 2014-2018. *Source: Maryland Department of Health - Maryland’s NEDSS And PRISM Databases*

**DATA TABLES**

The following data tables were developed and used to populate five (5) of the eight (8) parameters: Injuries, Death, Property Damage, Crop Damage, and Annualized Events.

**FLOOD (TIDAL/COASTAL)**

<b>Flood Hazard Data Table</b>					
<b>Injuries</b>	<b>Deaths</b>	<b>Property Damage</b>	<b>Crop Damage</b>	<b>Geographic Extent % in 100-yr Flood Zone (A, AE, AO &amp; VE)</b>	<b>Days with Events (1996-2020)</b>
0	0	\$20k	\$0	18.23%	Total = 8 Annual Avg = 0.32
<i>*Note: Data collected for 1950-present, no data available for this event type prior to 1996</i>					

<b>Flash Flood Hazard Data Table</b>					
<b>Injuries</b>	<b>Deaths</b>	<b>Property Damage</b>	<b>Crop Damage</b>	<b>Geographic Extent % in 100-yr Flood Zone (A, AE, AO &amp; VE)</b>	<b>Days with Events (2000-2020)</b>
0	0	\$50k	\$0	18.23%	Total = 9 Annual Avg = 0.43
<i>Note: Data collected for 1950-present, no data available for this event type prior to 2000</i>					

<b>Heavy Rain Hazard Data Table</b>					
<b>Injuries</b>	<b>Deaths</b>	<b>Property Damage</b>	<b>Crop Damage</b>	<b>Geographic Extent</b>	<b>Days with Events (1998-2020)</b>
0	0	\$0	\$0	18.23%	Total = 47 Annual Avg = 2.04
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1998</i>					

**DROUGHT**

Drought Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1998-2020)
0	0	\$0	\$2.0M	% Crop land cover from 2019 USDA Crop Land Data = 37%	Total = 30* Annual Avg = 1.30
*Note: One event recorded in 1998 that spanned 30 days. A very dry period from July through November resulted in drought-like conditions across much of the Lower Maryland Eastern Shore. This caused significant crop damage and other drought-related problems throughout much of the area.					

**TORNADO**

Tornado Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1962-2020)
2	0	\$1.163M	\$0	Sum of Events = 8	Total = 8 Annual Avg = 0.14
Note: Data collected for 1950-present, no data available for this event type prior to 1962					

**HIGH WINDS**

High Wind Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1999-2020)
0	0	\$1.049M	\$0	ASCE Wind Design Speed = 120	Total = 9 Annual Avg = 0.41
Note: Data collected for 1950-present, no data available for this event type prior to 1999					

**WILDFIRE**

High Wind Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Events (2000-2020)
1	1	\$0	\$0	Avg Annual Acres Burned = 0.012%	Total = 418 Annual Avg = 29.13
Note: Data obtained from MD-DNR Forest Service for 2000-2020.					



**EARTHQUAKE**

No NCEI data available for this hazard; however, one (1) earthquake with a magnitude of 3.3 was recorded in Ocean City, Maryland on 10/14/1928.

**WINTER STORM**

Winter Storm Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1996-2020)
0	0	\$0	\$0	Average snowfall total: 7" (1996-present NOAA/NWS)	Total = 35 Annual Avg = 1.40
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1996</i>					

Winter Weather Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1999-2020)
0	0	\$0	\$0	Average snowfall total: 7" (1996-present NOAA/NWS)	Total = 34 Annual Avg = 1.55
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1999</i>					

**EXTREME COLD – COLD/WIND CHILL**

*\*Note: An arctic air mass settled over the mid-Atlantic states resulting in record breaking cold across the lower Maryland Eastern Shore. The temperature dropped to 1 below zero at the Salisbury Airport on the morning of the 5<sup>th</sup>, and 2 below zero on the 6<sup>th</sup>.*

**COASTAL STORM AND FLOODING**

Coastal Flood Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent % in 100-yr Flood Zone (A, AE, AO & VE)	Days with Events (2012-2020)
0	0	\$250k	\$0k	% of County in Coastal Land Area = 49%	Total = 4 Annual Avg = 0.44
<i>Note: Data collected for 1950-present, no data available for this event type prior to 2012</i>					

Tropical Storm Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1996-2020)
0	0	\$795K	\$1M	% of County in Coastal Land Area = 49%	Total = 6 Annual Avg = 0.24
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1996</i>					

Hurricane Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1996-2020)
0	0	\$10k	\$60k	% of County in Coastal Land Area = 49%	Total = 3 Annual Avg = 0.12
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1996</i>					

**STORM SURGE**

No NCEI data available for this hazard

**THUNDERSTORM**

Thunderstorm Wind Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1958-2020)
0	0	\$363k	\$0	Sum of Events = 96	Total = 96 Annual Avg = 1.52
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1958</i>					

Lightning Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1998-2020)
1	1	\$110K	\$0	Sum of Events = 5	Total = 5 Annual Avg = 0.22
<i>Note: Data collected for 1950-present, no data available for this event type prior to 1998</i>					

Hail Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (1967-2020)
0	0	\$0	\$0	Sum of Events = 21	Total = 21 Annual Avg = 0.39

*Note: Data collected for 1950-present, no data available for this event type prior to 1967*

**EXTREME HEAT**

Extreme Heat Hazard Data Table					
Injuries	Deaths	Property Damage	Crop Damage	Geographic Extent	Days with Events (2011-2020)
0	0	\$0	\$0	Countywide	Total = 3 Annual Avg = 0.30

*Note: One event recorded that spanned 3 days. An extended period of excessive heat and humidity occurred across most of the Lower Maryland Eastern Shore from July 21st to July 23rd. High temperatures ranged from 96 to 103 degrees during the afternoons, with heat index values ranging from 110 to 119. Overnight lows only fell into the mid 70's to mid 80's.*

**PANDEMIC AND EMERGING INFECTIOUS DISEASES**

Cases of Selected Notifiable Conditions Reported Wicomico County, Maryland					
Condition	2014	2015	2016	2017	2018
Anaplasmosis	0	0	1	0	1
Animal Bites	293	271	251	195	299
Babesiosis	0	2	0	0	0
Campylobacteriosis	21	34	23	23	35
Chlamydia	575	499	667	646	835
Coccidioidomycosis	0	1	0	0	0
Cryptosporidiosis	0	2	0	0	1
Dengue Fever	1	0	1	0	0
Ehrlichiosis	6	4	4	4	3
Encephalitis – non-Arboviral	0	0	0	4	3
Giardiasis	4	2	2	2	3
Gonorrhea	188	168	232	300	388
H. influenzae – invasive disease	1	1	3	2	1
Hemolytic Uremic Syndrome post-diarrhea	0	0	0	0	1
Hepatitis B (acute symptomatic)	3	2	0	0	1
Hepatitis C (acute symptomatic)	1	2	1	3	3
Kawasaki Syndrome	1	0	0	1	0

<b>Cases of Selected Notifiable Conditions Reported Wicomico County, Maryland</b>					
<b>Condition</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>Legionellosis</b>	0	1	0	1	5
<b>Listeriosis</b>	0	0	0	1	1
<b>Lyme Disease</b>	20	14	10	29	11
<b>Meningitis, aseptic</b>	21	18	16	12	22
<b>Meningitis, fungal</b>	2	1	2	0	0
<b>Microsporidiosis</b>	0	0	0	1	0
<b>Mycobacteriosis, Other than TB &amp; Leprosy</b>	11	19	20	15	15
<b>Pertussis</b>	1	0	1	3	1
<b>Rabies - Animal</b>	12	11	8	5	6
<b>Salmonellosis – other than typhoid fever</b>	28	29	34	41	42
<b>Shiga toxin producing E. coli (STEC)</b>	4	0	1	2	3
<b>Shigellosis</b>	0	1	8	4	4
<b>Spotted Fever Rickettsiosis</b>	0	0	1	3	4
<b>Strep Group A – Invasive Disease</b>	4	4	3	8	4
<b>Strep Group B – Invasive Disease</b>	10	11	17	19	17
<b>Strep pneumoniae - Invasive Disease</b>	10	9	8	10	9
<b>Syphilis – primary and secondary</b>	3	7	1	2	5
<b>Tuberculosis</b>	3	4	3	1	2
<b>Typhoid Fever - acute</b>	0	1	0	1	2
<b>Vibriosis (non-cholera)</b>	2	0	1	1	1
<b>Yersiniosis</b>	0	0	0	0	1
<b>Zika virus disease, non-congenital</b>	**	**	4	0	0
<b>Zika virus infection, congenital</b>	**	**	1	0	0
<b>Zika virus infection, non-congenital</b>	**	**	2	5	0
<b>TOTALS:</b>	1,225	1,118	1,326	1,344	1,729
<p><i>* Data sources: Maryland's NEDSS and PRISM databases. Data is current as of 1/15/2021. These are active databases and counts may vary slightly over time, as well as differ slightly from counts published by the Centers for Disease Control and Prevention (CDC). HIV/AIDS data are not included here but available at <a href="http://phpa.dhmh.maryland.gov/OIDEOR/CHSE/SitePages/statistics.aspx">http://phpa.dhmh.maryland.gov/OIDEOR/CHSE/SitePages/statistics.aspx</a>.</i></p> <p><i>** Zika virus infections not reported for the years 2014 and 2015 in the database.</i></p>					