

<b>NWS Form E-5</b> (04-2006) (PRES. BY NWS Instruction 10-924)	<b>U.S. DEPARTMENT OF COMMERCE</b> <b>NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</b> <b>NATIONAL WEATHER SERVICE</b>	HYDROLOGIC SERVICE AREA (HSA) <b>Boston/Norton MA</b>	
		REPORT FOR: MONTH                      YEAR <b>August                      2021</b>	
<b>MONTHLY REPORT OF HYDROLOGIC CONDITIONS</b>		SIGNATURE Nicole M. Belk Senior Service Hydrologist	
TO:                      Hydrologic Information Center, W/OS31 NOAA's National Weather Service 1325 East West Highway Silver Spring, MD 20910-3283		DATE <b>October 12<sup>th</sup> 2021</b>	

When no flooding occurs, include miscellaneous river conditions below the small box, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924).

An X inside this box indicates that no flooding occurred within this hydrologic service area.

Much of southern New England had normal to above normal rainfall during August, though rainfall totals across the region varied considerably. For most of the region, rainfall totals ranged from 4 to 8 inches, with some higher totals over 8 inches in the Hartford area. These rainfall totals ranged from normal to 4 inches above normal, except 4 to 5+ inches above normal in the Hartford area. Rainfall was below normal in the vicinity of Quabbin Reservoir in MA, and along the Cape and Islands. In those areas, rainfall totals ranged from 1.5 to 4.5 inches. These totals were normal to 2 inches below normal. Map 5 depicts the rainfall totals across the region, with Map 6 showing the rainfall departure from normal.

More details for major climate sites in southern New England are included in Table 1. The table also includes ranking for wettest August on record (where applicable), and also ranking for warmest August on record at each station.

State Drought Declarations were in place on Cape Cod in MA. No other State Drought Declarations were in place across RI, CT and the remainder of MA.

<i>Location</i>	<i>August Rainfall (Inches)</i>	<i>Precipitation Departure from Normal (Inches)</i>	<i>Temperature Departure from Normal (Degrees F)</i>	<i>Ranking for Wettest August on Record</i>	<i>Ranking for Warmest August on Record</i>
<b>Boston</b>	7.00	+3.77	+4.2	10 <sup>th</sup>	2 <sup>nd</sup>
<b>Worcester</b>	5.42	+1.28	+3.2	N/A	3 <sup>rd</sup> (tie w/1920)
<b>Providence</b>	4.83	+1.24	+2.6	N/A	5 <sup>th</sup>
<b>Hartford</b>	8.80	+4.59	+2.3	4 <sup>th</sup>	7 <sup>th</sup>

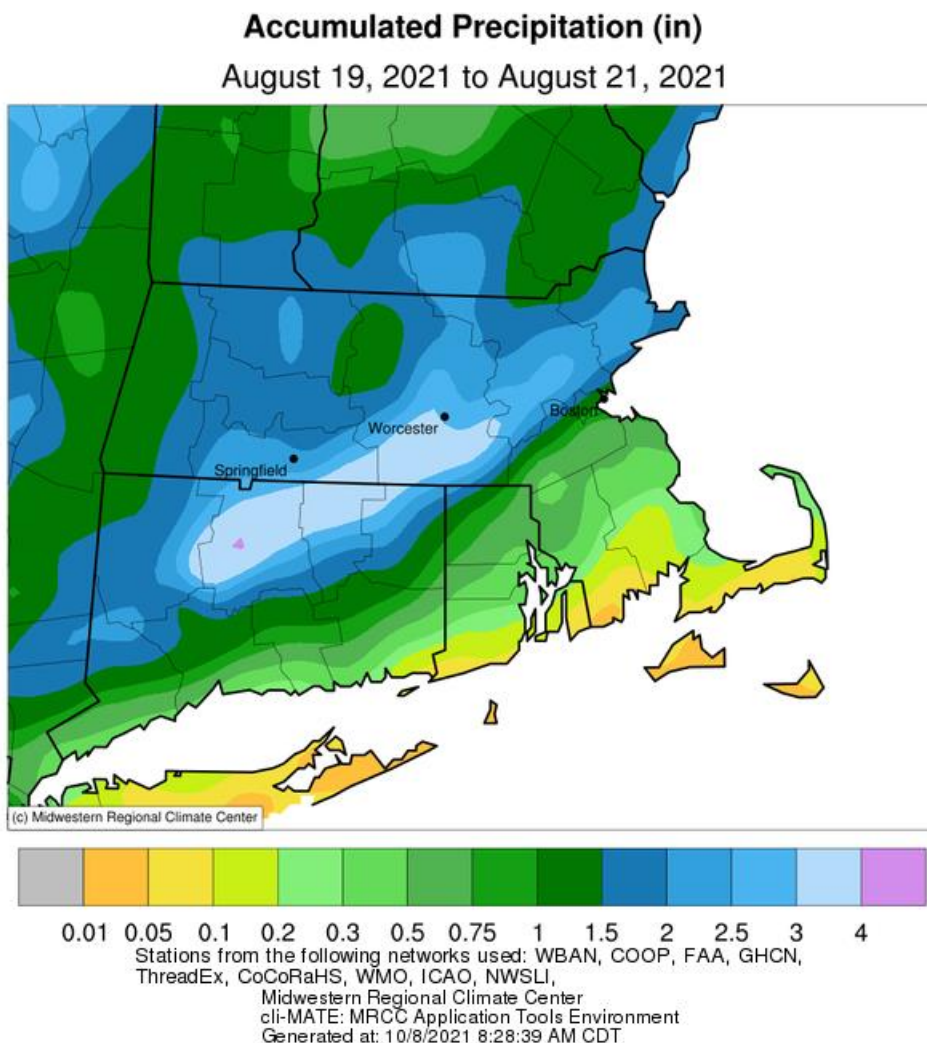
Table 1. August 2021 rainfall and departure from normal, temperature departure from normal, and rankings for wettest and warmest August on record (where applicable), for major climate sites within southern New England. Information is preliminary.

### Flooding During August

There were 2 back-to-back freshwater flood events during the month of August. The first event occurred with remnants of Fred- this rainfall and flood event mainly occurred on August 19<sup>th</sup>, but did extend into the 20<sup>th</sup>. The second rain event occurred on August 22<sup>nd</sup> to 24<sup>th</sup> as Tropical Storm Henri made landfall in Westerly, then lingered over the region as a remnant low during the 23<sup>rd</sup>. Within NWS Boston/Norton's Hydrologic Service

Area, the heaviest rainfall from both events occurred in north central CT. With little time for freshwater flooding from Fred to recede, impacts in north central CT were compounded when Henri’s rainfall hit that area. A summary of each event follows.

On August 19th, the remnants of Fred arrived from inland/west, then tracked across southern New England. Fred’s remnants brought heavy rainfall and pockets of flooding. Across much of the area, rainfall totals ranged between 1 and 3 inches (Map 1). Higher totals of 3 to 4 inches were more common from the Hartford area northeast to Worcester. However, the highest totals in Hartford County CT were in excess of 5 inches. Lower totals of an inch or less were noted across most of RI, southeast MA, the Cape and Islands.



Map 1. Rainfall associated with the remnants of Fred, from August 19<sup>th</sup> to 21<sup>st</sup> 2021. Map from the Midwestern Regional Climate Center, cli-MATE Application.

There were multiple reports of urban flooding in the Greater Hartford area, the City of Worcester, and the MA North Shore. Two tributary rivers in north central CT, the North Branch Park and Hockanum Rivers, also flooded. Flooding reports and details follow.

Greater Hartford Area: In Hartford, the North Branch Park River crested at 9.98 feet at 11 am on the 19<sup>th</sup>, Flood Stage is 8 feet. Flooding occurred on sections of Albany Ave, Laurel Street, Governor Street and Farmington

Ave. Cars were reported stuck in floodwaters. At the intersection of South Whitney Street and Warrenton Ave, floodwaters were 3 feet deep. Basement flooding was reported St. Francis Hospital.

In East Hartford, the Hockanum River crested at 9.52 feet at 2:15 pm on the 19<sup>th</sup>. Flood Stage is 9 feet. In West Hartford, a portion of South Main Street was flooded and impassable. Several streets were flooded and impassable, including portions of Brewster Road, Skonet Road, and King Philip Drive at Mohawk Drive. Cars were stuck in floodwaters. In Avon, Route 10 Southbound (Waterville Rd) just south of Route 44 was flooded, with 5 cars stuck in street flooding. In Simsbury, basement flooding was reported at Hickory Hill Road.

City of Worcester: In Worcester, there were multiple reports of street flooding. This included the following roads and intersections: William Street at Somerset Street, Southbridge Street, Mckeon Road, Quinsigimond Ave. at Lamartine Street, East Central Street under the I-290 Bridge, Glennie Street, Millbrook Street under the I-190 Bridge, and Enid Street at Commonwealth Ave.

MA North Shore and immediate Boston area: In Peabody, Pierpoint Street and Main Street were flooded and impassable. In Lynn, multiple road closures due to flooding were reported across town. In Somerville, McGrath Highway at Middlesex Ave was flooded.

On August 22<sup>nd</sup>, Tropical Storm Henri made landfall at Westerly RI, then tracked westward through CT. Then on the 23<sup>rd</sup>, the remnant low of Henri turned eastward and tracked across southern New England a second time. Rainfall from this event mainly occurred during the 22<sup>nd</sup> and 23<sup>rd</sup>. However, in eastern MA rainfall did not end until after midnight EDT on the 23<sup>rd</sup>/24<sup>th</sup>.

Rainfall totals were the highest across CT and western MA, with event totals mainly between 2 and 5 inches (Map 2), and localized higher totals. Across RI into central and eastern MA, rainfall totals were lower, between 1 and 3 inches. The lowest totals were across the Cape and Islands with rainfall of one inch or less.

The most significant flooding occurred in the Greater Hartford Area on the 22<sup>nd</sup>. In addition to a significant amount of street flooding, there was also damage to roadways and bridges due to those floodwaters- in particular in Vernon and Manchester CT. Pockets of urban and poor drainage flooding were also reported in Springfield, eastern MA, and southern RI.

Flooding reports from Henri follow.

Greater Hartford Area: Much of the flooding from this event was focused in north central CT. Many streets were flooded in the area. Additional area flood impacts are noted below.

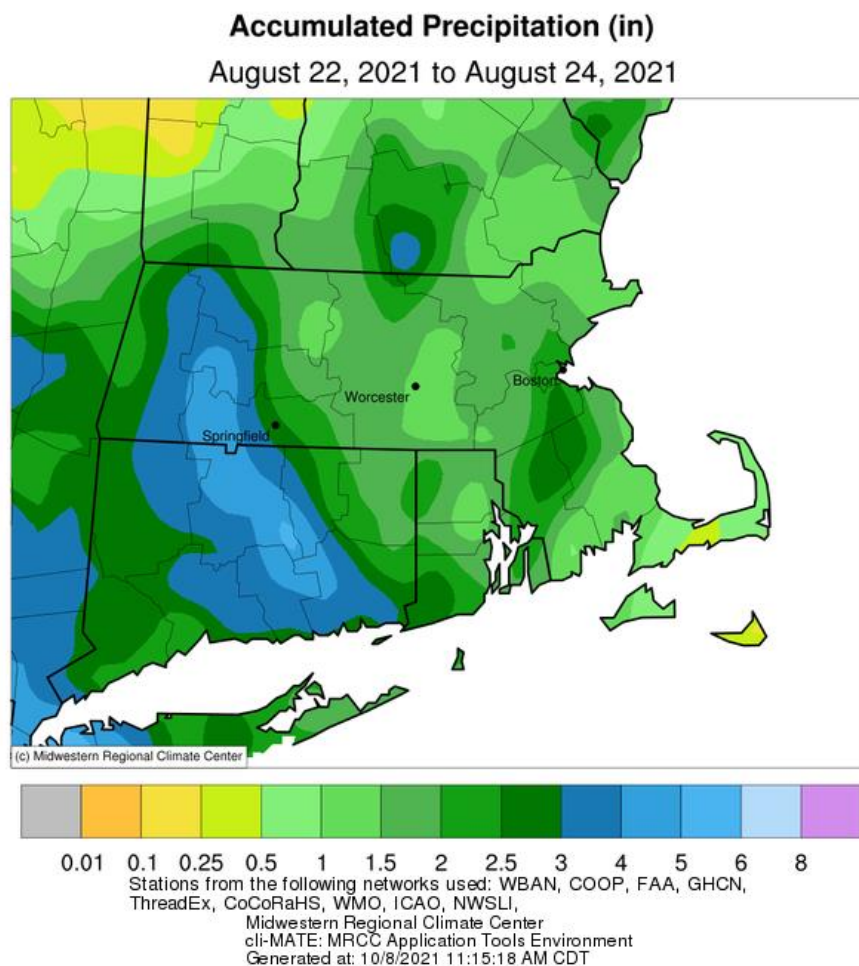
In Hartford, preliminary data indicated the North Branch Park River crested at 8.17 feet at 8:15 pm on the 22<sup>nd</sup>. Flood Stage is 8 feet. In East Hartford, preliminary data indicated the Hockanum River crested at 11.78 feet at 9:30 pm on the 22<sup>nd</sup>, in Moderate Flood (Flood Stage is 9 feet).

In Manchester CT, fire officials evacuated 18 homes due to flooding. Four first-floor condominium units on Prospect Street were flooded when Hop Brook overflowed its banks. Floodwaters also entered the first floor of Highland Park Elementary School. Roadways with significant flooding included (but were not limited to) Gerard Street, Prospect Street, Lydall Street, and Route 83 near Vernon. A culvert running under Ambassador Drive collapsed, destroying that section of road.

In Vernon CT, the Hockanum River overflowed a roadway connecting Hartford Turnpike to the Colonial Corners shopping plaza, a motel, and a few other businesses. A significant amount of damage was done to the area parking lot. The motel residents were trapped by floodwaters, with local officials creating an egress onto I-84 to evacuate those residents.

In Wethersfield CT, the northbound side of I-91 in the vicinity of Exit 25 was closed due to floodwaters.

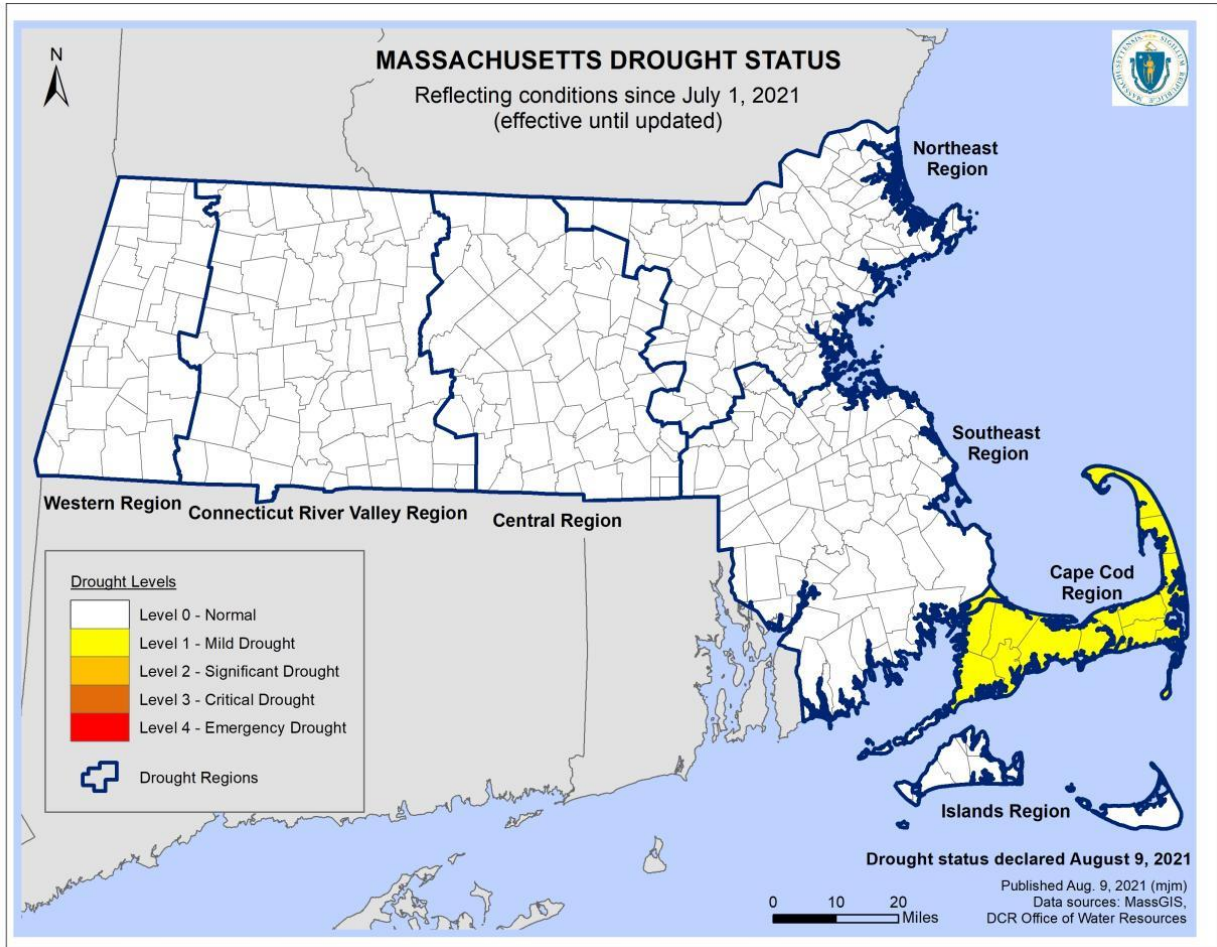
Remainder of southern New England: Isolated street flooding was reported in Springfield MA, Braintree and Boston MA, as well as Fall River, Taunton, and Lakeville in southeast MA. In Narragansett RI, a combination of heavy rainfall and storm surge resulted in flooded shoreline roadways, including Ocean Road, Beach Street, and ocean access points at Pilgrim Ave. and Conant Ave.



Map 2. Rainfall totals from Henri, from August 22<sup>nd</sup> to 24<sup>th</sup> 2021. Map from the Midwestern Regional Climate Center, cli-MATE Application.

## MA State Drought Declaration Update

The MA Drought Management Task Force (DMTF) convened on August 5<sup>th</sup> to review conditions from July and early August. While much of southern New England had normal to above normal rainfall, Cape Cod continued to experience below normal precipitation. Thus groundwater levels remained below normal there too. A Level 1-Mild Drought was continued on Cape Cod. The remaining Drought Regions stayed at normal conditions (no drought). These updates are also available on Map 3.



Map 3. MA Drought Declarations from August 9<sup>th</sup> 2021, retroactive to July 1<sup>st</sup> 2021. Map from MA DCR, Office of Water Resources.

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## U.S. Drought Monitor

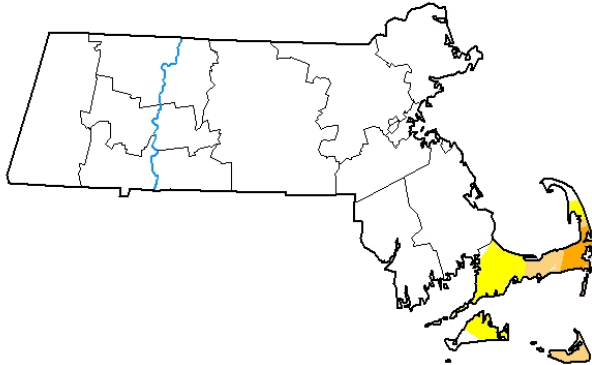
On the August 31st rendition of the US Drought Monitor (Map 4), normal conditions prevailed across most of the region. Exceptions follow. About ½ of Cape Cod was under D0, or Abnormally Dry Conditions. Nantucket and a portion of the mid Cape were under D1, or Moderate Drought Conditions. A small area of D2, Severe Drought, was in place at the elbow of the Cape.

## Streamflow and Groundwater

For most of August, USGS gages indicated streamflows were at above normal, to much above normal for any given day. The exception was on Cape Cod, where streamflows were normal to below normal. USGS groundwater wells were at above to much above normal levels. The exception was on the Cape and Islands. On Martha’s Vineyard and Nantucket, groundwater was near normal. On Cape Cod, most groundwater wells were running below normal.

# U.S. Drought Monitor Massachusetts

**August 31, 2021**  
(Released Thursday, Sep. 2, 2021)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	94.00	6.00	2.59	1.00	0.00	0.00
<b>Last Week</b> 08-24-2021	94.00	6.00	2.59	1.00	0.00	0.00
<b>3 Months Ago</b> 06-01-2021	96.28	3.72	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12-29-2020	99.99	0.01	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 09-29-2020	0.00	100.00	95.92	83.01	28.36	0.00
<b>One Year Ago</b> 09-01-2020	0.77	99.23	86.85	35.02	0.00	0.00

**Intensity:**  
 None (White)      D2 Severe Drought (Yellow-Orange)  
 D0 Abnormally Dry (Yellow)      D3 Extreme Drought (Red)  
 D1 Moderate Drought (Orange)      D4 Exceptional Drought (Dark Red)

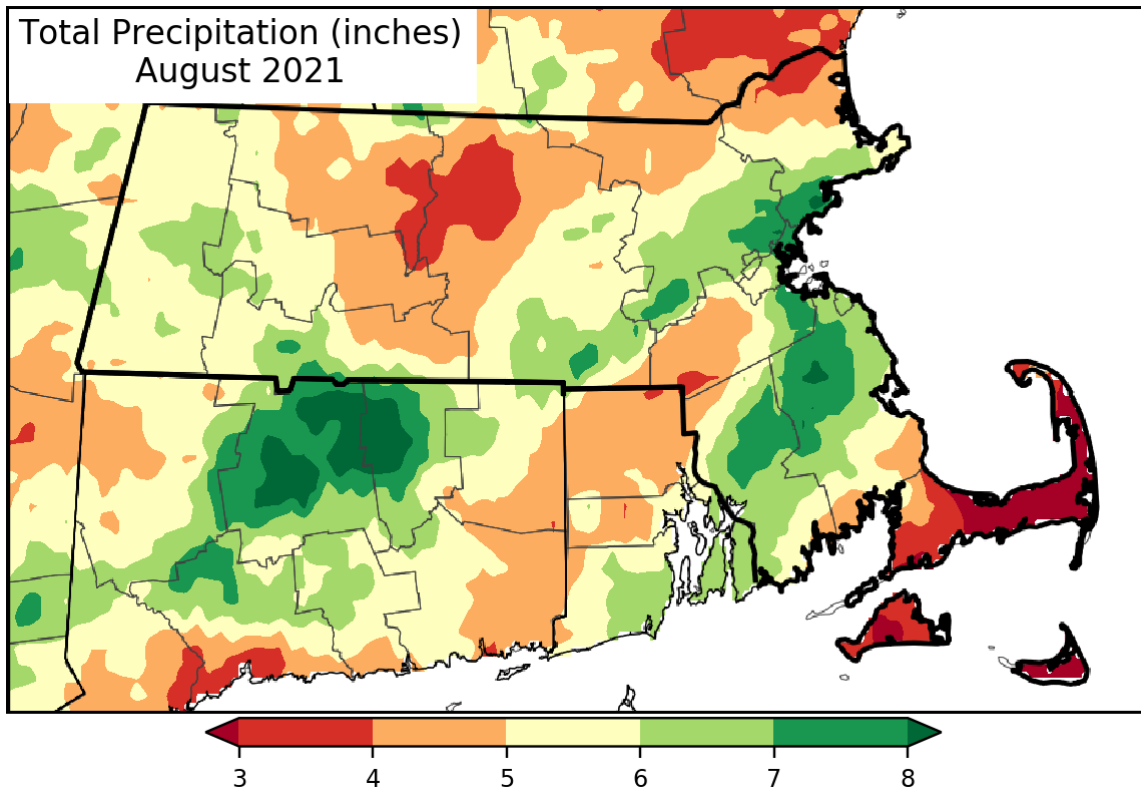
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

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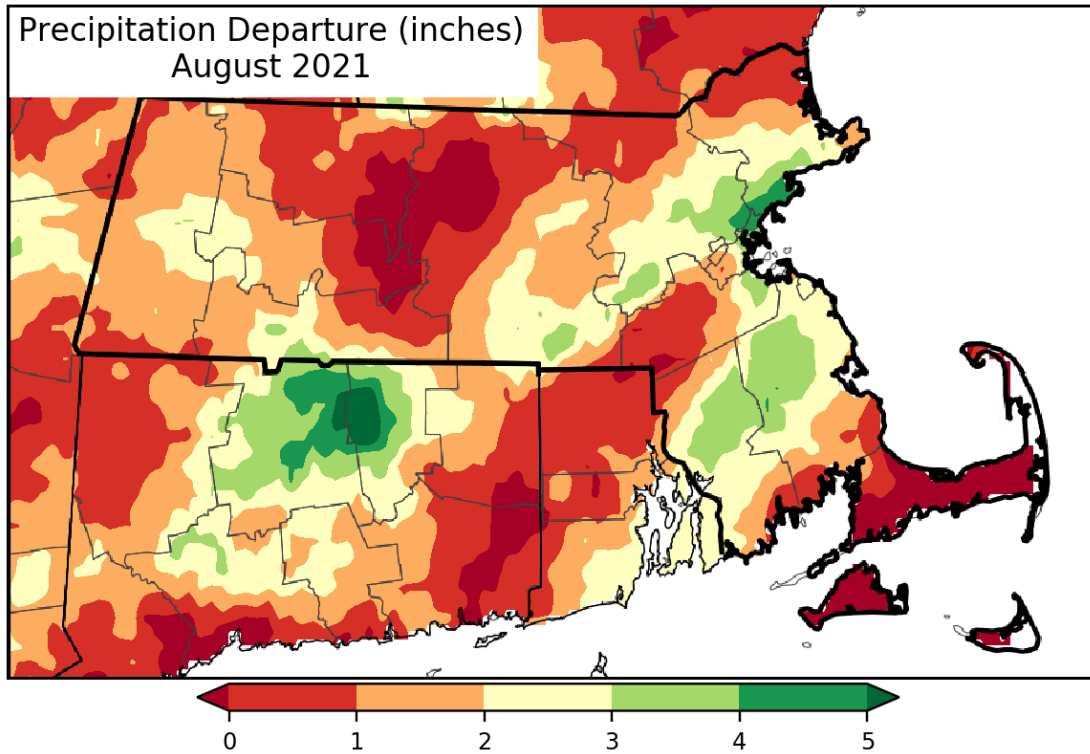


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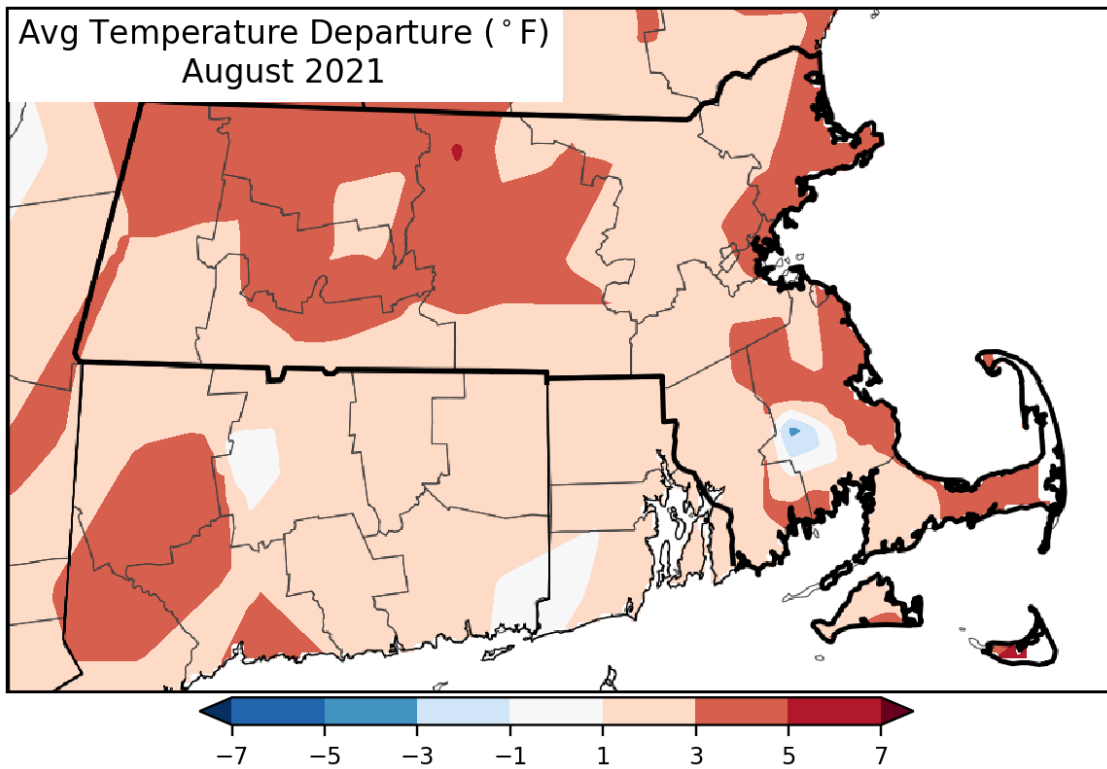
Map 4. US Drought Monitor Map for Massachusetts, valid August 31<sup>st</sup> 2021.



Map 5: August 2021 rainfall for southern New England. From the Northeast Regional Climate Center.



Map 6. August 2021 rainfall departure from normal for southern New England. From the Northeast Regional Climate Center.



Map 7. Average temperature departure from normal across southern New England for August 2021. From the Northeast Regional Climate Center.

**Rhode Island Precipitation**  
**National Weather Service Boston/Norton, MA**  
Preliminary Precipitation Data (inches) by Drought Region  
Past 12 to 36 months ending September 2021  
*Includes CoCoRaHS Data*

<b>RI 1 month September 2021</b>	Rainfall	Departure	Percent	Normal
Northwest	6.64	2.55	162	4.09
Northeast	6.07	2.13	154	3.94
Central West	5.91	1.93	148	3.98
Central East	5.88	1.96	150	3.92
Eastern	9.17	5.44	246	3.73
Southern	8.29	4.07	196	4.22
New Shoreham	5.46	1.24	129	4.22

<b>RI 2 month Aug-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	11.91	3.49	141	8.42
Northeast	10.46	2.39	130	8.07
Central West	11.28	3.28	141	8.00
Central East	10.68	3.16	142	7.52
Eastern	15.65	8.12	208	7.53
Southern	14.41	5.83	168	8.58
New Shoreham	11.93	3.35	139	8.58

<b>RI 3 month Jul-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	22.74	10.50	186	12.24
Northeast	21.26	9.38	179	11.88
Central West	18.93	7.29	163	11.64
Central East	18.59	7.78	172	10.81
Eastern	20.33	10.01	197	10.32
Southern	19.64	7.40	160	12.24
New Shoreham	14.56	2.32	119	12.24

<b>RI 6 month Apr-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	36.46	11.02	143	25.44
Northeast	34.28	9.68	139	24.60
Central West	32.10	7.97	133	24.13
Central East	30.54	8.18	137	22.36
Eastern	30.87	8.21	136	22.66
Southern	30.07	4.56	118	25.51
New Shoreham	24.48	-1.03	96	25.51

<b>RI 12 month Oct 20-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	64.64	10.94	120	53.70
Northeast	62.21	10.79	121	51.42
Central West	62.96	12.19	124	50.77
Central East	59.00	11.82	125	47.18
Eastern	56.32	7.78	116	48.54
Southern	60.54	7.67	115	52.87
New Shoreham	57.31	4.44	108	52.87

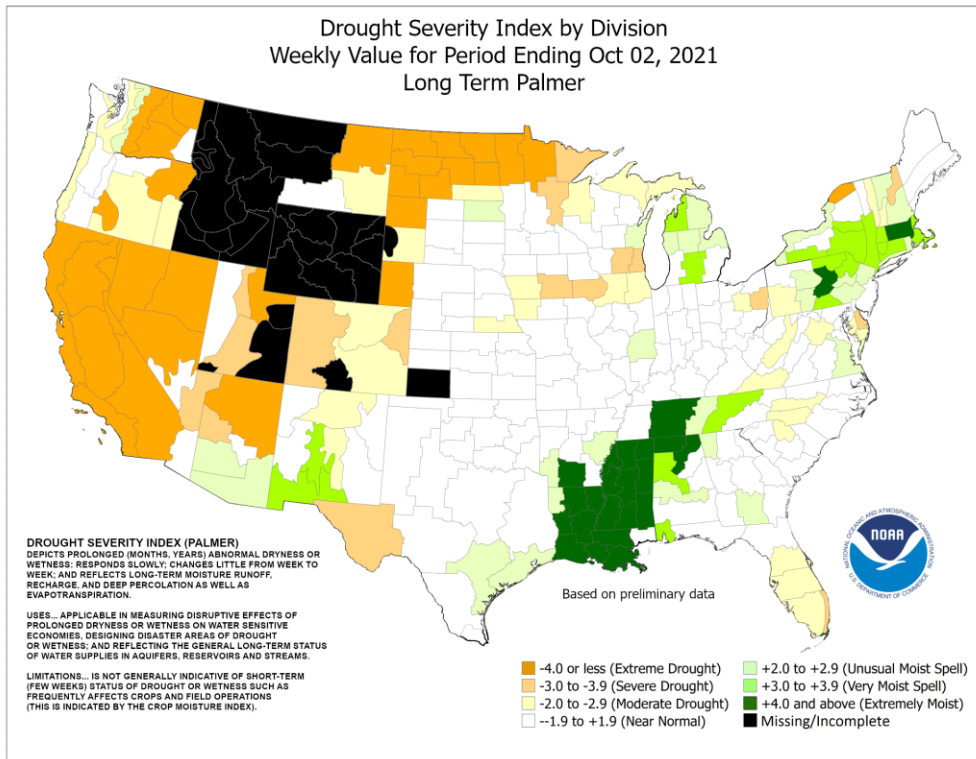


<b>RI 24 month Oct 19-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	110.69	3.28	103	107.40
Northeast	107.58	4.74	105	102.84
Central West	109.23	7.69	108	101.54
Central East	101.47	7.11	108	94.36
Eastern	96.79	-0.29	100	97.08
Southern	105.81	0.07	100	105.74
New Shoreham	98.30	-7.44	93	105.74

<b>RI 36 month Oct 18-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	176.05	14.95	109	161.10
Northeast	169.06	14.80	110	154.26
Central West	173.64	21.33	114	152.31
Central East	161.57	20.03	114	141.54
Eastern	154.85	9.23	106	145.62
Southern	172.27	13.66	109	158.61
New Shoreham	157.48	-1.13	99	158.61

<b>RI 4 month Jun-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	26.10	9.28	155	16.82
Northeast	24.28	8.19	151	16.09
Central West	22.20	6.42	141	15.78
Central East	21.52	7.07	149	14.45
Eastern	22.22	8.02	156	14.20
Southern	21.54	5.02	130	16.52
New Shoreham	15.41	-1.11	93	16.52

<b>RI 5 month May-Sep 21</b>	Rainfall	Departure	Percent	Normal
Northwest	32.42	11.68	156	20.74
Northeast	30.09	10.22	151	19.87
Central West	27.59	8.06	141	19.53
Central East	26.67	8.67	148	18.00
Eastern	27.25	9.41	153	17.84
Southern	26.36	5.89	129	20.47
New Shoreham	20.74	0.27	101	20.47



RI Palmer Drought Index from the Climate Prediction Center, NOAA, dated 10/2/21.  
**RI Palmer is in an Unusual Moist Spell, +2.91.**

**U.S. Drought Monitor  
Rhode Island**

**October 5, 2021**  
(Released Thursday, Oct. 7, 2021)  
Valid 8 a.m. EDT



**Intensity:**

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <http://droughtmonitor.unl.edu/About.aspx>

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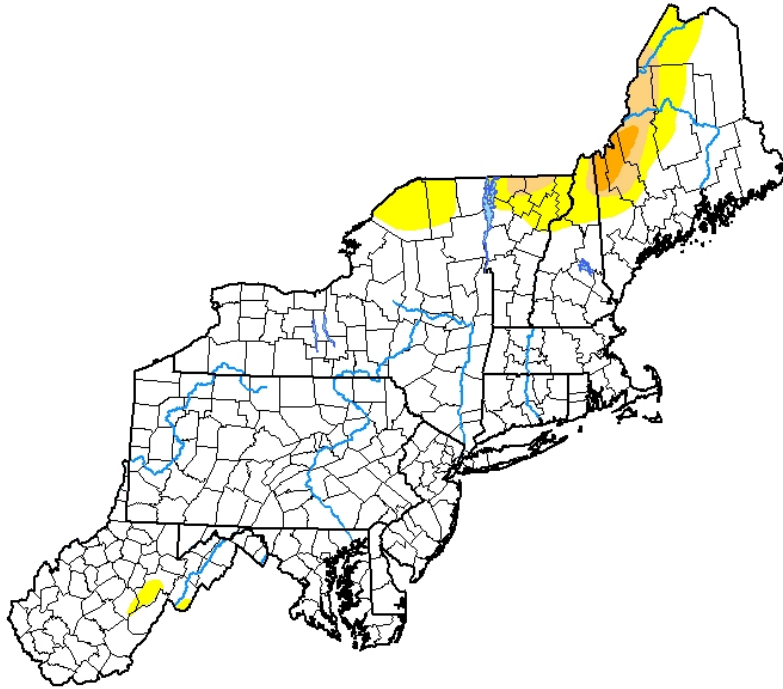


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Map 2. US Drought Monitor for Rhode Island. valid 10/5/2021.

**U.S. Drought Monitor**  
**Northeast**

**October 5, 2021**  
(Released Thursday, Oct. 7, 2021)  
Valid 8 a.m. EDT



**Intensity:**

-  None
-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

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Map 3. US Drought Monitor for the Northeast US, valid 10/5/2021.