

NWS Form E-5
(04-2006)
(PRES. BY NWS Instruction 10-924)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

HYDROLOGIC SERVICE AREA (HSA)

MONTHLY REPORT OF HYDROLOGIC CONDITIONS

WFO Caribou, Maine

REPORT FOR:
MONTH YEAR

October 2022

TO: Hydrologic Information Center, W/OS31
NOAA's National Weather Service
1325 East West Highway
Silver Spring, MD 20910-3283

SIGNATURE

James Sinko
Hydrology Program Manager

DATE

November 13, 2022

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.

October 2022

October featured well above average temperatures as the month averaged from 3-6 degrees above average across the area. Temperatures alternated from below to above average early in the month, but from the 13th of the month through the end of the month were consistently above average. The month ended as the 3rd warmest October on Record in both Caribou and Houlton behind only 2017 and 2021. In Millinocket it was the 5th warmest October on Record, and in Bangor it ranked as the 10th warmest on record.

In Caribou, the stretch from October 13th-31st this year was the warmest same stretch in recorded history. October 13th-31st featured an average temperature of 52.1°F which beat the previous 13th-31st stretch of 50.9° in 2017 with the 3rd place just last year in 2021. The October 13th-31st stretch in Millinocket tied the record for the same stretch of days in 2017 at an average temperature of 52.2°F. In Caribou there were an amazing 21 days with a high temperature of 60 degrees or warmer, which was the most in recorded history during the month of October. Houlton also observed 21 days with a high of 60°F or higher, just shy of the record of 22 such days set in 2017. Millinocket had 23 days with a high of 60°F or warmer, which was just shy of their record of 25 days set in 1903 and again in 2017. Bangor had 22 days with a high of 60° or warmer, which fell short of the record of 28 days in 2017. Areas across Northern Maine that did not experience a hard freeze in mid to late September did during the opening days of October with several consecutive nights below freezing. Bangor as well as much of the Downeast region also received multiple freezes early in October. This allowed for the fall foliage to peak during the first week of the month across the St. John Valley and by the middle of the month in Bangor and along the coast.

This was a direct result of a pattern that featured a negative North Atlantic Oscillation (NAO) pattern with a monthly mean of -0.72 standard deviation. The Pacific North American (PNA) pattern averaged the month around neutral at +0.17 standard deviation. This is well depicted below in the reanalysis of

the monthly anomaly of the 500mb Geopotential Heights. Decent blocking took place over the North Atlantic which had significantly higher anomalies. The mean jet stream was then oriented from southwest to northeast over the state directly resulting in the significantly above average temperatures.

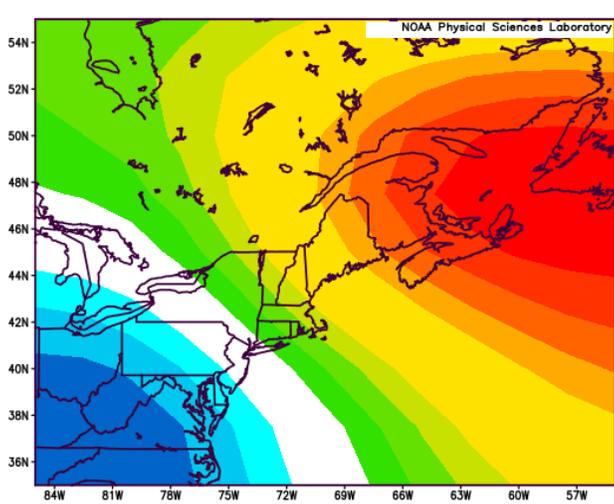


Figure 1: 500mb Geopotential Height (m) Anomalies (1991-2020 Climo) October 2022

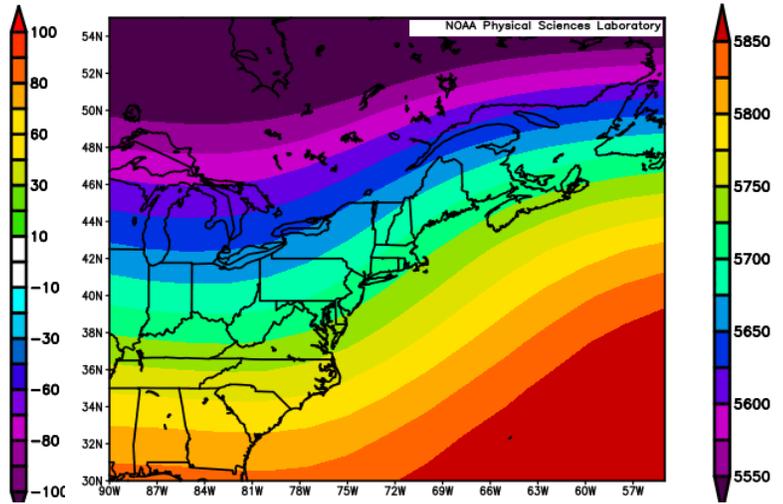


Figure 2: 500mb Geopotential Height (m) Composite Mean October 2022

Source: [NOAA Physical Sciences Laboratory](https://www.noaa.gov/physical-sciences-laboratory)

<i>Town/City</i>	<i>Avg Monthly Temperature (°F)</i>	<i>Normal Monthly Temperature (°F)</i>	<i>Departure from Normal (°F)</i>
Frenchville	49.5	43.8	+5.7
Fort Kent	47.0	41.8	+5.2
Caribou	49.8	44.5	+5.3
Houlton	49.8	44.3	+5.5
Millinocket	50.4	46.0	+4.4
Greenville	50.2	44.9	+5.3
Bangor	51.6	48.2	+3.4
Robbinston	52.1	48.0	+4.1
Topsfield	51.1	46.4	+4.7

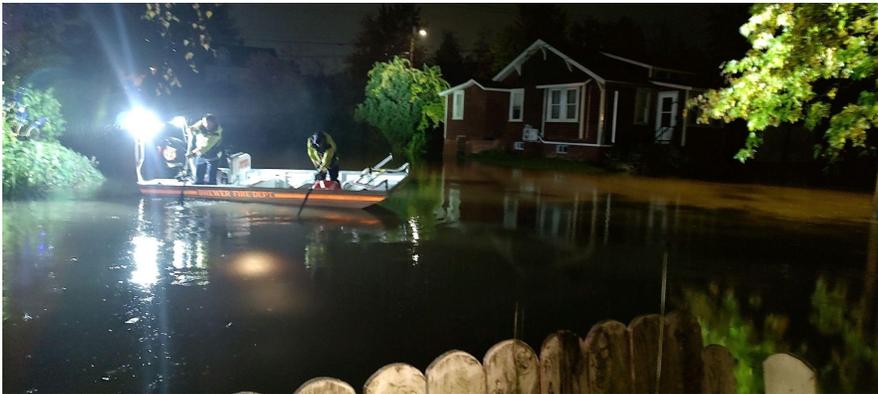
October rainfall varied from well above average to slightly below average across the area due to a couple significant rain events. Total rainfall ranged from 150% to 225% of normal in a corridor from Bangor north to the western St. John Valley, but only 60% to 90% of normal in Northern Washington County and Southeast Aroostook county as well as Northern Somerset County. In Bangor, it was the 3rd wettest October on record with 8.87 inches of rain observed with 2003 and 2005 being the wetter. In Millinocket it was the 5th wettest on record with 7.71 inches. In a sharp contrast, Houlton observed only 2.65 inches of rain, which was 1.39 inches below average. A significant rain event on the 14th into the 15th produced a 2-Day total of 5 inches at Bangor, including 3.2 inches on the 15th. The 2-day total of 5 inches was the 13th greatest 2-day total on record, and the 2nd greatest 2-day total for the month of October. The 3.2 inches of rain on the 15th was the 2nd greatest daily rainfall ever observed in Bangor during the month of October behind only October 8th, 2005, when 3.98 inches of rain was observed.



In the early morning hours of October 15th doppler radar was showing a large cluster of convection (*Heavy Rain & Thunderstorms*) with very cold cloud tops moving over the Greater Bangor region and portions of Hancock county. A Flood Advisory was in effect across the area with 1-2 inch rainfall rates. However, the stronger convection began to produce very excessive rainfall in the Greater Bangor area. This prompted a Flash Flood Warning to be issued at 3:03AM in south-central Penobscot County including the Greater Bangor area as automated rain gauges were reporting up to 2 inches falling per hour. Flash Flood Guidance was around 2-2.5 inches per hour at the time of this warning. First report of flash flooding came at 3:42AM from the Bangor Fire Department twitter account showing water causing manhole covers to float off their spots. They also reported several disabled vehicles and numerous roads being impassable. *This picture is courtesy of the Bangor Fire Department and was located on Main Street near I-395.*



Additional reports of flash flooding were reported across the Penobscot in the City of Brewer. These next two images *thanks to the Brewer Fire Department* show a water rescue was required on Brooks Street. The Brewer Fire Department reported that they had 4-5 ft deep water in a basement of a home and caused gasoline fumes to fill a house. The Brewer Fire Department arrived on scene and required the use of their newly acquired rescue boat to shuttle the residents 200 feet to dry land from the significant standing water from the excessive rainfall.



Rainfall totals with this excessive rain ranged from 2.5 inches in Otis to 3.19 inches in Castine to 4.79 inches at the Bangor International Airport to 5.25 inches in Glenburn. As the morning progressed we continued to receive flooding reports from the public, fire departments, law enforcement and Maine Department of

Transportation (MDOT). The Jo Mary Road west of Millinocket was “washed out” after 3-4 inches fell with 3.25 inches falling at the airport. MDOT advised that Route 157 in Molunkus Township in Penobscot County was partially underwater after 2.5-3.5 inches of rain fell in the area. Similar rainfall caused a portion of Route 155 in Enfield to flood during the early morning hours. Additionally the same rainfall across the area caused a portion of Old Military Road in Winn to collapse due to rushing water overwhelming the culvert. In Hancock County the Sheriff's Department reported that Route 166A in the

area of Doug's Meadow near Castine flooded in the morning of the 15th with 3.19 inches of rain falling in Castine. Lastly, there was additional flooding near the town of Penobscot in Hancock County where portions of the New Road (Route 175) was closed due to flooding 2-2.5 inches of rain fell.



There were additional wash outs across the area mainly impacting the private dirt and gravel roads in the North Woods. However, we did receive a report from the Greenville Fire Department where a partial road collapse occurred due to significant water runoff near Blair Hill that impacted the northbound lane of Lily Bay Road. During the mid morning hours we learned from MDOT and Penobscot County 9-1-1 of the Glenburn Fire Department dealing with a wash out of the Pushaw Road that was being caused by flooding of the Marsh Area near Pushaw Lake. This photo is *thanks to Deputy Boyd of the Penobscot County Sheriff's Office*. Just after this photo was taken the

remaining pavement fell into the raging stream that was flowing through the area. Maine DOT was able to reopen the by October 26th which is a heavily used road in the town of Glenburn.

Another rainfall event occurred late day October 18th into the morning of October 19th. Rainfall totals ranged from 1-2.5 inches across the area. There were higher amounts of 3 inches in Parkman located in Piscataquis County. During the early morning hours 2-2.5 inches of rain fell in the Orneville area resulting in significant runoff from the terrain along Route 6/16 into the Dead Stream. Just upstream NE of the Dead Stream the Canadian Pacific Railway has a rail line that runs along Route 6/16. As the rain was developing around 11pm a train was heading towards Brownville and passed the bog and creek that flows into the Dead Stream. This train passed through the area without any issues. Approximately 4.5 hours later the train was heading back towards Hermon when it reached the creek crossing at 45.17933891912302, -68.87744568827488 and discovered the culvert had eroded and washed out. There was no time to stop the train that consisted of 3 locomotive engines and approximately 9 cars. The train derailed with the 3 locomotives derailing and six cars that resulted in a spill of asphalt into the water of this creek. Emergency and railroad officials responded to the incident and thankfully no one was hurt.

We had an additional significant rain event on October 26-27th that resulted in some significant totals across the area. Aroostook County totals ranged from 0.25-1 inch from west to east with the highest totals near Route 1 with exception of a 1.40 inch report in Oxbow. Rainfall amounts were on the low side generally less than 0.5 inch in the North Woods. Penobscot County saw totals ranging from near 1 inch in Corinna to 2.40 inches in Old Town. Bangor International Airport reported 1.48 inches and 1.62 inches in Millinocket. Much of Piscataquis County reports were less than 1 inch except for Brownville at 1.54 inches. In Washington County rainfall ranged from around 0.5 inch in eastern areas to 1.5 inches

in western areas with the highest in Jonesboro at 1.81 inches. The highest totals were across Hancock County with totals in the 1-2.5 inch range with the highest amounts in Bar Harbor & Castine at 2.79 inches and 2.82 inches in Brooksville. As of this report date no damage or impacts were reported from the excessive rainfall in this event.

Streamflows across much of the state started the month at low-end normal to well below normal thanks to the very dry September in most locations. However, improvement began with the rainfall events throughout the month of October. The first two significant rainfall events brought river levels by October 22nd to “Much Above Normal” for daily discharge values. On October 22nd there were 20 gages in Eastern/Northern Maine that were at >90th percentile for daily discharge. Out of those 20 gages there were 8 gages at “All-time high for the day” which is the 100th percentile. Streamflows receded slightly by the end of the month but the last significant rain event once again allowed for increased discharge. When it comes to the monthly average the Upper Penobscot and Piscataquis Basin averaged “Much Above Normal” with >90th percentile with mean normal values 200-350% of normal. The Aroostook River basin averaged “Above Normal” in the 76-90th percentile with both Masardis & Washburn gages at 170-185% of mean normal values. The St. John Basin due to being “Much Below Normal” to “Below Normal” at the beginning of the month and missing the heaviest rains ended up averaging the month at “Normal”. The exception to this was the Allagash River where the monthly discharge was >90th percentile ending as “Much Above Normal” given significant rainfall within its catch basin. The Mattawamkeag & Narraguagus River’s both ended the month averaging “Above Normal” in the 76-90th percentile. The only place in the state where rivers continued to struggle was the St. Croix basin as all 3 heavy rain events mostly missed the catch basin. Grand Lake Stream ended the month “Below Normal” in the 10-24th percentile with reduced discharge from the lake. The St. Croix in Vanceboro ended the month “Below Normal” also in the 10-24th percentile but the St. Croix at Baring ended up “Normal” at 66% normal (mean).

Groundwater across the North Woods continued to see improvement throughout the month after starting October “Below Normal” in the 10-25th percentile at Clayton Lake to ending the month with an average of “Normal”. At Fort Kent the month started at “Normal” but with significant rainfall the daily readings were “Above Normal” by the end of the month which averaged to “Normal”. Across North-Central Maine including the Baxter Region and Moosehead the beginning of the month daily readings were on the low end of “Normal” but increased to “Much Above Normal” in the 90-95th percentile. This allowed for the month to average at “Normal”. Across the Highlands of Maine including the Greater Bangor area the daily values began in the low end “Normal” range and ended “Much Above Normal” which resulted in “Normal” monthly average. Lastly, Downeast groundwater values started October in the “Normal” range but ended the month “Much Above Normal” with even Daily Records at the Calais observation site. The Calais Groundwater period of record dates back to September of 1980. Downeast areas ended up averaging “Normal” for the entire month of October.

In regards to Drought monitoring, the month of October began with Abnormally Dry (D0) conditions across extreme western portions of Hancock County near Penobscot Bay and in far southeast Penobscot County. Rainfall which was significant in Hancock County allowed for all Drought categories to be removed by the end of the month. No Drought Conditions to end October.

Read below for specific details & maps of Precipitation, Streamflows, Groundwater Levels, Non-Routine Hydrologic Products issued by WFO Caribou and Drought conditions.

Precipitation Totals for Select Locations with all units in inches

Location	Total Precip	Normal Precip	Departure from Normal	% of Normal	Snowfall	Normal Snowfall	Departure from Normal	Greatest Snow Depth
Frenchville	4.90	3.46	+1.44	141.6%				
Fort Kent	6.15	4.26	+1.89	144.3%	0.0	1.1	-1.1	0
Caribou	4.46	3.99	+0.47	111.7%	0.0	1.7	-1.7	0
Houlton	2.65	4.04	-1.39	65.6%				
*Millinocket	7.71	4.55	+3.16	169.4%	0.0			0
Greenville	7.84	5.00	+2.84	156.8%				
Bangor	8.87	4.58	+4.29	193.6%	0.0	0.6	-0.6	0
Robbinston	5.92	5.43	+0.49	109.0%				
Topsfield	4.46	5.39	-0.93	82.7%	0.0	1.0	-1.0	0

**Millinocket snowfall measured at CoOp site, not the ASOS site. No departure data is available.*

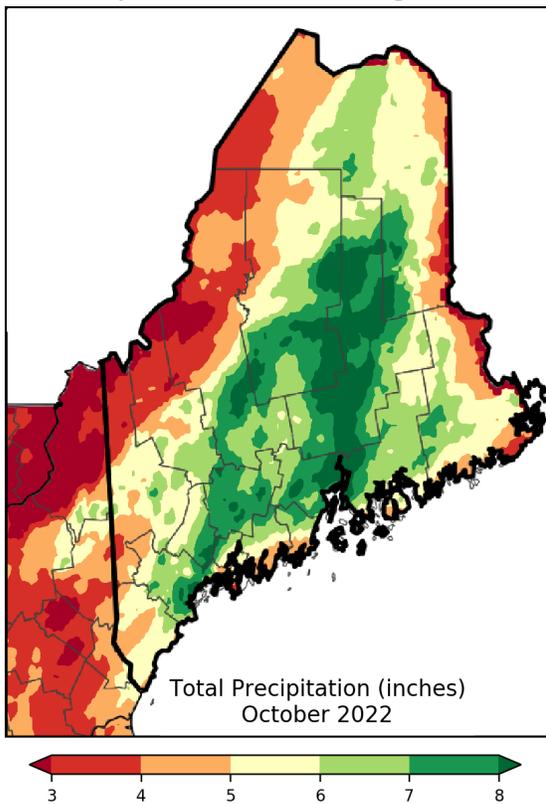


Figure 3: Monthly Precipitation Totals for October 2022

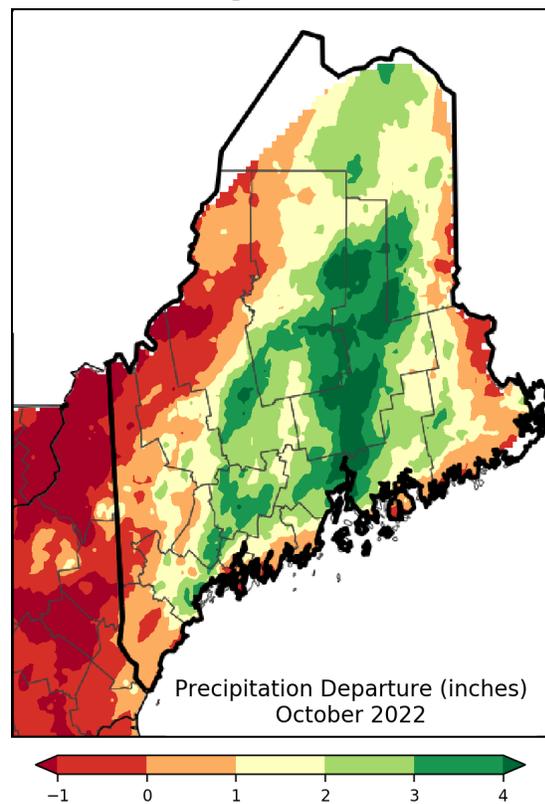


Figure 4: Monthly Precipitation Departures from Normal for October

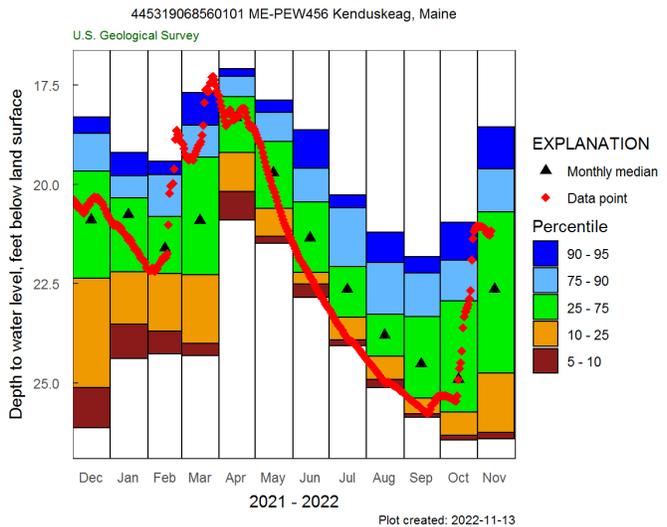
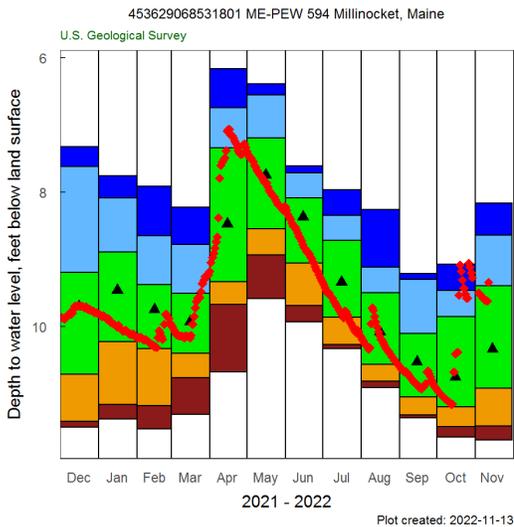
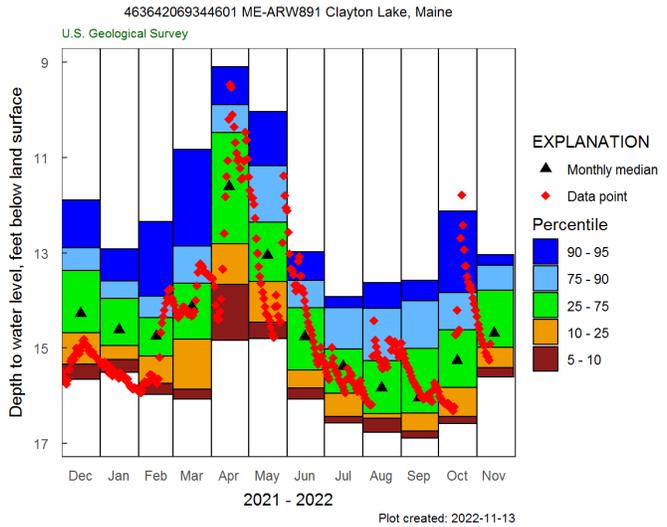
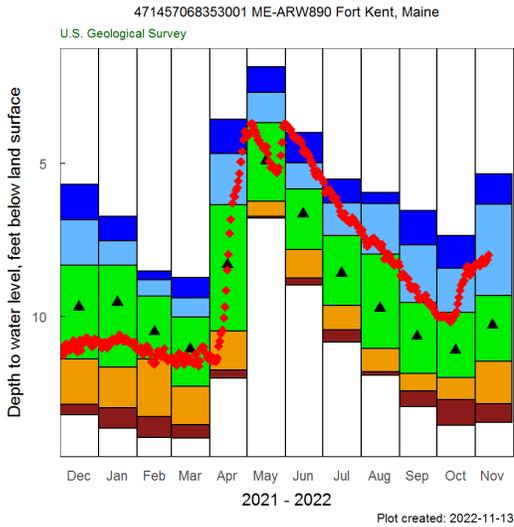
Source: [Northeast Regional Climate Center](#)

October Streamflows for Rivers

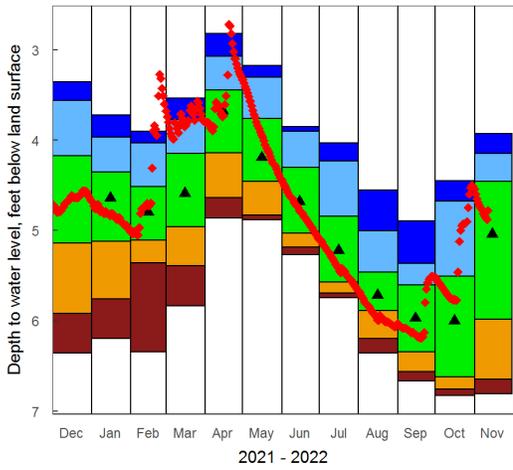
River	Monthly Mean Flow (cfs)	% Normal (mean)	Percentile Class	Drainage (mi ²)	Years of Record
Big Black River near Depot Mtn	197.60	67.38%	Normal	171	39
St. John River at Nine Mile Bridge	1720.47	80.38%	Normal	1341	72
Allagash River near Allagash	2403.32	180.97%	Much Above Normal	1478	93
St. John River at Dickey	3441.29	91.19%	Normal	2680	78
St. John River at Fort Kent	4067.83	58.87%	Normal	5929	96
Fish River near Fort Kent	758.07	93.71%	Normal	873	93
Aroostook River near Masardis	1932.87	173.16%	Above Normal	892	65
Aroostook River at Washburn	3471.10	184.12%	Above Normal	1654	92
St. Croix River at Vanceboro	383.63	64.27%	Below Normal	413	93
St. Croix River at Baring	1296.18	66.05%	Normal	1374	63
Grand Lake Stream at Grand Lake Stream	195.03	56.79%	Below Normal	228.3	93
Narraguagus River at Cherryfield	581.01	190.23%	Above Normal	227	74
East Branch Penobscot River at Grindstone	3331.39	243.07%	Much Above Normal	837	100
Mattawamkeag near Mattawamkeag	3422.52	219.05%	Above Normal	1418	87
Piscataquis River near Dover-Foxcroft	1174.94	268.71%	Much Above Normal	298	119
Sebec River at Sebec	1291.25	328.03%	Much Above Normal	326	66
Piscataquis River at Medford	4438.26	248.88%	Much Above Normal	1162	90
Penobscot River at West Enfield	18611.29	207.98%	Much Above Normal	6422	119

October Groundwater Levels

Station	Percentile Class	Years of Record
Hadley Lakes	Normal	37
Kenduskeag	Normal	44
Calais	Normal	23
Millinocket	Normal	28
Clayton Lake	Normal	44
Fort Kent	Normal	44

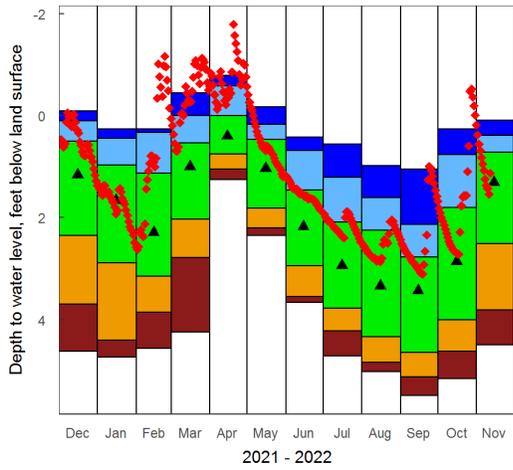


445227067520101 ME-WW797 Township T24MD BPP (Hadley Lakes)
U.S. Geological Survey



Plot created: 2022-11-13

450713067162801 ME-WW796 Calais, Maine
U.S. Geological Survey



Plot created: 2022-11-13

Figure 5-10: Groundwater Level Yearly Plots to Current
Source: [United States Geological Survey](https://www.usgs.gov/)

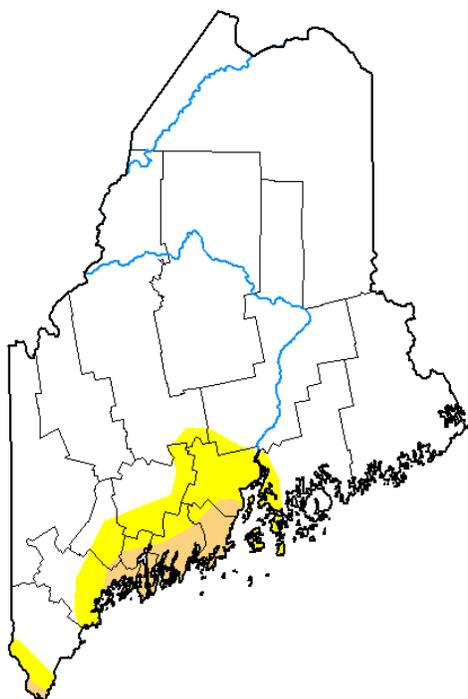
Flow or Water Level	Percentile Range	Explanation
Low	0 th	The monthly mean streamflow or median water level during this month is the lowest ever recorded during the period of record for this site.
Much below normal	0 th to 10 th	The monthly mean streamflow or median water level during this month is less than the 10 th percentile when compared to all of the months during the period of record for this site.
Below normal	10 th to 25 th	The monthly mean streamflow or median water level during this month is between the 10 th and 25 th percentiles when compared to all of the months during the period of record for this site.
Normal	25 th to 75 th	The monthly mean streamflow or median water level during this month is between the 25 th and 75 th percentiles when compared to all of the months during the period of record for this site.
Above normal	75 th to 90 th	The monthly mean streamflow or median water level during this month is between the 75 th and 90 th percentiles when compared to all of the months during the period of record for this site.
Much above normal	90 th to 100 th	The monthly mean streamflow or median water level during this month is greater than the 90 th percentile when compared to all of the months during the period of record for this site.
High	100 th	The monthly mean streamflow or median water level during this month is the highest ever recorded during the period of record for this site.

**Non-Routine Hydrologic Products
October 2022
WFO Caribou, ME**

Product	How Many Issued	Reason for Issuance
Flash Flood Warning	1	Convection
Flood Advisory	7	Excessive Rainfall
Flood Watch	3	Excessive Rainfall

Drought Conditions for October 2022

**U.S. Drought Monitor
Maine**



October 4, 2022

(Released Thursday, Oct. 6, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	88.86	11.14	3.23	0.00	0.00	0.00
Last Week <i>09-27-2022</i>	88.92	11.08	3.23	0.00	0.00	0.00
3 Months Ago <i>07-05-2022</i>	25.63	74.37	35.69	0.00	0.00	0.00
Start of Calendar Year <i>01-04-2022</i>	72.42	27.58	11.82	5.32	0.00	0.00
Start of Water Year <i>09-27-2022</i>	88.92	11.08	3.23	0.00	0.00	0.00
One Year Ago <i>10-05-2021</i>	66.54	33.46	15.50	4.85	0.00	0.00

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 <https://droughtmonitor.unl.edu/About.aspx>

Author:

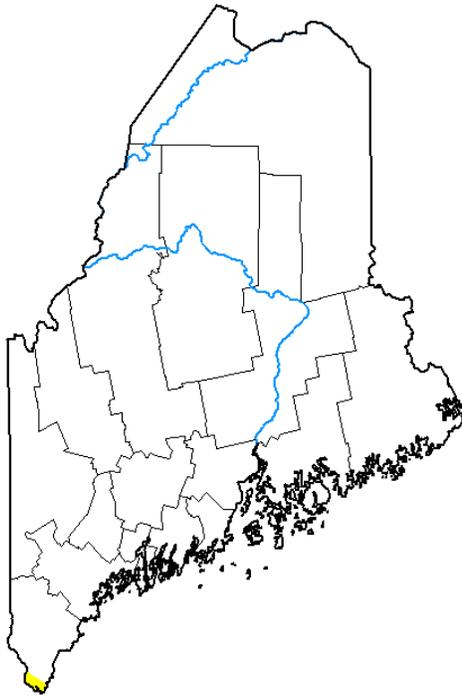
Brad Pugh
CPC/NOAA



droughtmonitor.unl.edu

U.S. Drought Monitor
Maine

October 25, 2022
(Released Thursday, Oct. 27, 2022)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	99.85	0.15	0.00	0.00	0.00	0.00
Last Week 10-18-2022	96.49	3.51	0.00	0.00	0.00	0.00
3 Months Ago 07-26-2022	28.48	71.52	42.19	0.00	0.00	0.00
Start of Calendar Year 01-04-2022	72.42	27.58	11.82	5.32	0.00	0.00
Start of Water Year 09-27-2022	88.92	11.08	3.23	0.00	0.00	0.00
One Year Ago 10-26-2021	64.76	35.24	15.50	6.56	0.00	0.00

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 <https://droughtmonitor.unl.edu/About.aspx>

Author:

Adam Hartman
NOAA/NWS/NCEP/CPC



droughtmonitor.unl.edu

Drought Classification (Cumulative Percent Area %)

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
10/4/2022	88.86	11.14	3.23	0.00	0.00	0.00	14
10/25/2022	99.85	0.15	0.00	0.00	0.00	0.00	0
Change	10.99	-10.99	-3.23	0.00	0.00	0.00	-14

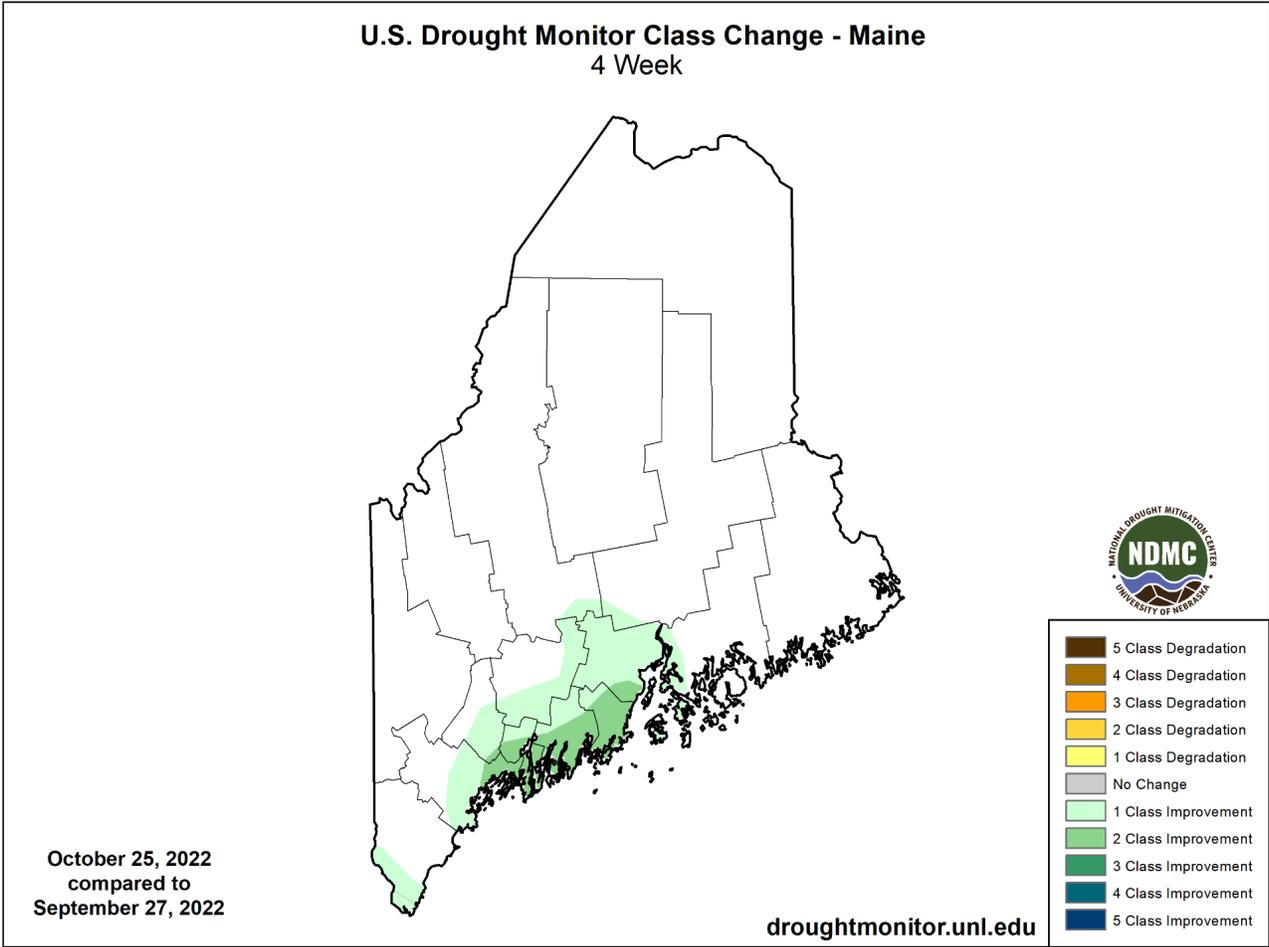


Figure 10-12: U.S. Drought Monitor Drought Classification & Statistics for October
 Source: [U.S. Drought Monitor](https://droughtmonitor.unl.edu)