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) **WFO Caribou, Maine**
MONTHLY REPORT OF HYDROLOGIC CONDITIONS	REPORT FOR: MONTH YEAR **July 2024**
TO: Hydrologic Information Center, W/OS31 NOAA's National Weather Service 1325 East West Highway Silver Spring, MD 20910-3283	SIGNATURE **James Sinko - Meteorologist Hydrology Program Manager**
	DATE **August 9, 2024**

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.

July 2024

July 2024 featured above average temperatures and below average rainfall across much of Eastern and Northern Maine except above average rainfall in the Central Highlands. July, the North Atlantic Oscillation (NAO) monthly mean was +1.46 SD as a Bermuda high was in place much of the month resulting in above normal heights in Maine. At the same time the Pacific North American Pattern (PNA) finished with a monthly mean of +2.60 SD which was the highest positive value since July 2022 (+2.54SD). The El Niño-Southern Oscillation (ENSO) pattern remains ENSO Neutral as the Niño 1+2 SST departures sit at -0.4°C and the Niño 3 region dropped to -0.3°C with Niño 3.4 region at -0.2°C. July's mean pattern at 500mb across Maine featured persistent troughing with a large ridge in the Western United States and the Bermuda high to the southeast. This resulted in 500mb heights generally 40-50m higher than average for the month compared to the 1991-2020 30yr climatological average. The overall mean flow across Maine was from the southwest which favored warm & humid days with convection the main source of rainfall.

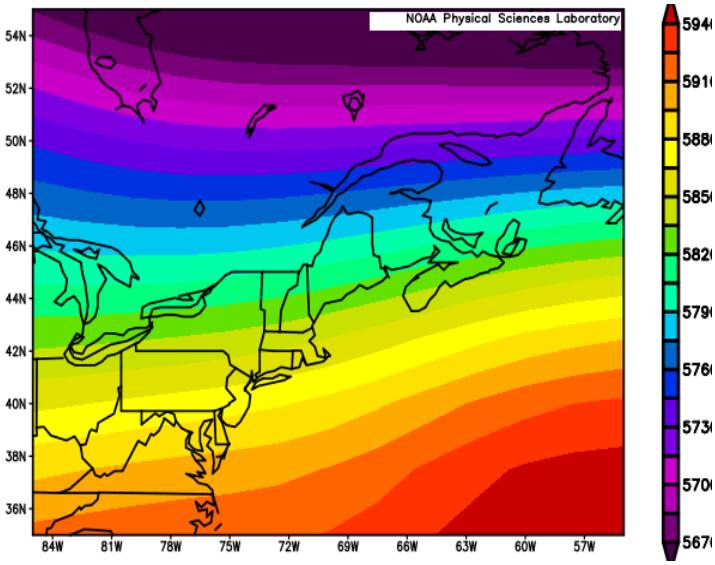


Figure 1: 500mb Geopotential Height (m) Anomalies *(1991-2020 Climo)*
July 2024

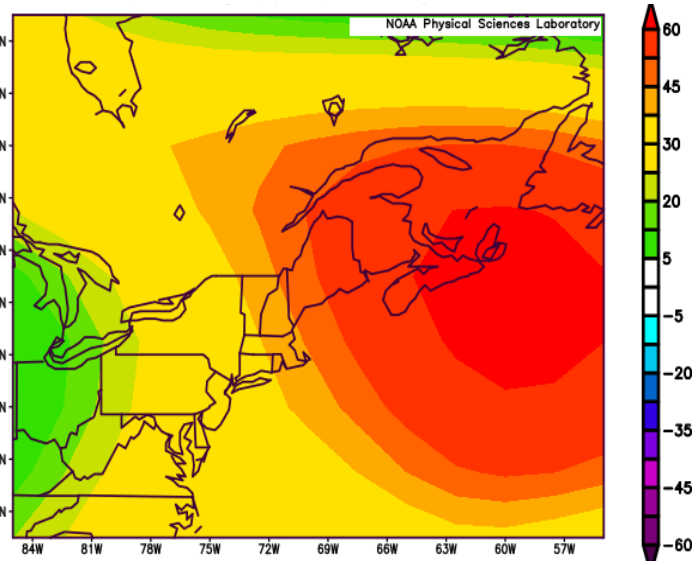


Figure 2: 500mb Geopotential Height (m) Composite Mean
July 2024

Source: NOAA Physical Sciences Laboratory

Precipitation Totals for Select Locations *(All Units in Inches)*

Location	Total Precip	Normal Precip	Departure from Normal	% of Normal	Snowfall	Normal Snowfall	Departure from Normal	Greatest Snow Depth	Monthly Average Snow Depth
Frenchville*	2.42	3.88	**-1.46**	62.4%					
Fort Kent	3.34	4.52	**-1.18**	73.9%	0.0	0.0	0.0	0	0.0
Van Buren	3.63	4.81	**-1.18**	75.5%	0.0	0.0	0.0	0	0.0
Caribou	4.20	4.23	**-0.03**	99.3%	0.0	0.0	0.0	0	0.0
Houlton	3.71	3.63	**0.08**	102.2%					
Millinocket*	6.01	4.16	**1.85**	144.5%	0.0			0	0.0
Greenville*	7.09	4.01	**3.08**	176.8%					
Moosehead*	3.97	4.03	**-0.06**	98.5%	0.0	0.0	0.0	0	0.0
Corinna	4.89	3.22	**1.67**	151.9%	0.0	0.0	0.0	0	0.0
Bangor	2.87	3.16	**-0.29**	90.8%	0.0	0.0	0.0	0	0.0
Grand Lake Stream	3.05	3.29	**-0.24**	92.7%	0.0	0.0	0.0	0	0.0
Robbinston*	4.95	3.18	**1.77**	155.7%	0.0	0.0	0.0	0	0.0

**Millinocket snowfall measured at CoOp site, not the ASOS site. *Moosehead Site is in GYX CWA.*
**Topsfield Records date back to 2000. *Robbinston Records dates back to 1994. *Greenville data gap between 1975 and 1999.*
**Frenchville ASOS has documented issues with precipitation measurements in the winter months.*

Precipitation across Eastern and Northern Maine ranged widely from north to south thanks to multiple rounds of convection and different rainfall events through the month, will try to break it down in the following... Rainfall was only 60-80% of normal in the far northern part of the Crown in the St. Francis River basin including Estcourt Station and down to the Allagash area then extending east in the St. John River Valley. There was a corridor of 100-150% of normal in the upper St. John basin, all of the Aroostook River basin and included Northern Piscataquis and Northern Penobscot counties. A bullseye of 180-230% of normal existed in far Northwestern Piscataquis County near Chemquasabamticook Lake. Rainfall was only 70-90% of normal across the northern portions of the Moosehead Region to Baxter State Park but quickly increased to around 100-120% in Northern Penobscot and Southern Aroostook County near Houlton. The largest departure at 140-225% of normal extended in a region from Greenville to Dexter eastward to include Dover-Foxcroft, Milo, Medway, Enfield, Springfield and east to Danforth. Across the Greater Bangor region, Interior Hancock and much of Washington counties ranged from 60-90% of normal. The worst conditions were featured in coastal Hancock county including MDI and Deer Isle where it was 20-40% of normal. Millinocket recorded 6.01 inches of rain for July 2024 which was the 10th highest July precipitation on record with historical data back to 1903. A flash flooding event occurred on July 10-11, 2024…See damage and details below.

Monthly **Evaporation** at WFO Caribou was 5.40 inches with only 4.20 inches that resulted in dry grounds and patchy brown lawns at times. We did see brown lawns and dry grounds noticeable across the Downeast coast and areas noted below normal above. On July 2, 2024 a small area of Abnormally Dry **Drought** (D0) was present near the Moosehead Lake region mainly on the Piscataquis & Somerset county border per the US Drought Monitor. This area under D0 was removed by the July 9, 2024 report and no areas in Eastern or Northern Maine were affected by drought in the rest of July 2024.

Streamflows featured significant improvements for the month of July compared to June 2024 across much of Northern and Central Maine with no improvements and worsening conditions in Downeast areas, however St. Croix river basin is highly controlled by dams. Much Above Normal streamflows for the monthly average were noted on the Piscataquis River basin and upper stretches of the St. John River basin including the Allagash River. Above normal conditions were featured on the Mattawamkeag River, Penobscot River and Aroostook River. Downeast rivers not including the St. Croix basins were around normal streamflows for July 2024. In the St. Croix basin we saw worsening streamflow conditions, however these rivers are highly controlled by dams and recreational activity. Grand Lake Stream featured a monthly average streamflow of 207 cubic feet per second (cfs) which was less than the 10th percentile (Much Below Normal). At the same time the St. Croix in Vanceboro was also Much Below Normal at a monthly average of 254cfs. Lastly, the St. Croix at Baring featured a monthly average flow of 495cfs which was one of the lowest July monthly flow averages on record with records dating back 63 years. More details on streamflows below…

Groundwater featured drying conditions across Eastern & Northern Maine indicative of the lack of rainfall, isolated nature of the rainfall and how the heavy rainfall mostly ran off with little absorption. Most locations across the region started the month Normal and remained Normal but falling to the low end of the Normal category or Central Highlands falling below normal by late month. The North Woods were at near record levels to start the month and fell to normal conditions by the end of the month, averaging at Above Normal conditions. Calais spent several days at Much Above Normal conditions but fell to Above Normal conditions throughout the end of the month which averaged out to Above Normal conditions. By the end of the month the 5cm (~2in) Soil Moisture Percentile (Regression Kriging Interpolation) indicated mainly drier conditions (below normal moisture) along the Downeast coast, Central Highlands and North Woods in the upper St. John & Penobscot River Basins. Well above normal moisture (95-99th percentile) was noted in the St. John Valley between St. Francis and Frenchville. Additional much above normal soil moisture conditions were noted between Chesuncook Lake and Mt. Katahdin.

Temperatures across the region ranged from around 2°F above the 30 year (1991-2020) normals over the Downeast areas to upwards of 4°F above average across the North and Moosehead Region. In Caribou, it was the 3rd warmest July on record (Mean 70.3°F), records in Caribou date back to 1939. Millinocket was the 5th warmest July on record (Mean 71.6°F) and Houlton was the 8th warmest July (Mean 69.3°F). Meanwhile, Bangor had its 9th warmest July on Record (Mean 72.2°F).

Town/City	Avg Monthly Temperature (°F)	Normal Monthly Temperature (°F)	Departure from Normal (°F)
Frenchville	69.2	66.1	**3.1**
Fort Kent	67.9	64.8	**3.1**
Van Buren	69.6	65.7	**3.9**
Caribou	70.3	66.7	**3.6**
Houlton	69.3	66.1	**3.2**
Millinocket	71.6	68.2	**3.4**
Greenville*	70.0	66.3	**3.7**
Moosehead	68.8	65.3	**3.5**
Corinna	71.8	69.2	**2.6**
Bangor	72.2	69.5	**2.7**
Grand Lake Stream	70.5	68.0	**2.5**
Robbinston*	68.5	66.5	**2.0**

**Topsfield Records date back to 2000, *Robbinston Records date back to 1994*
**Greenville data gap between 1975 and 1999 *Moosehead Site is in GYX CWA on CWA border*

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

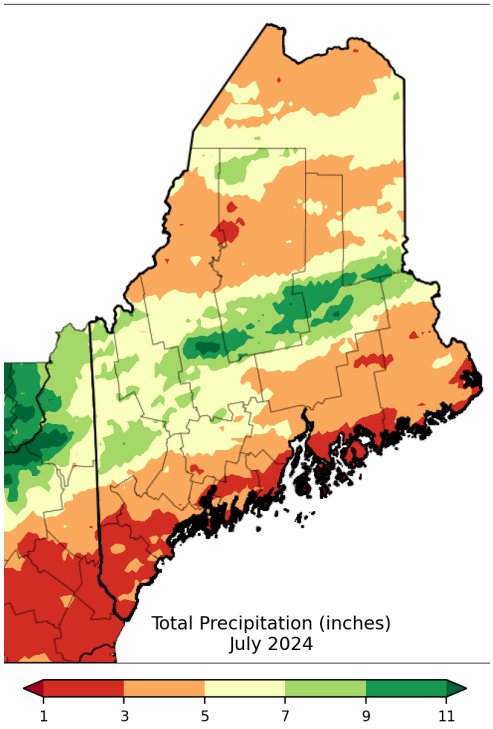


Figure 3: Total Liquid Precipitation for July

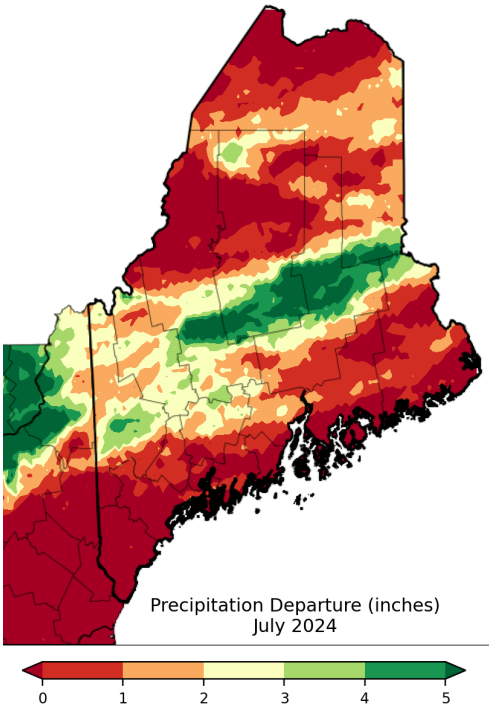


Figure 4: Liquid Precipitation Departure for July

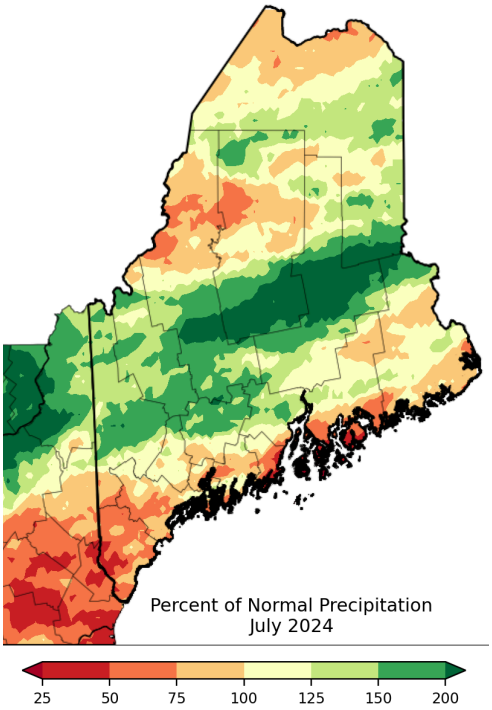


Figure 5: Percent of Normal Precipitation for July

Source: Northeast Regional Climate Center

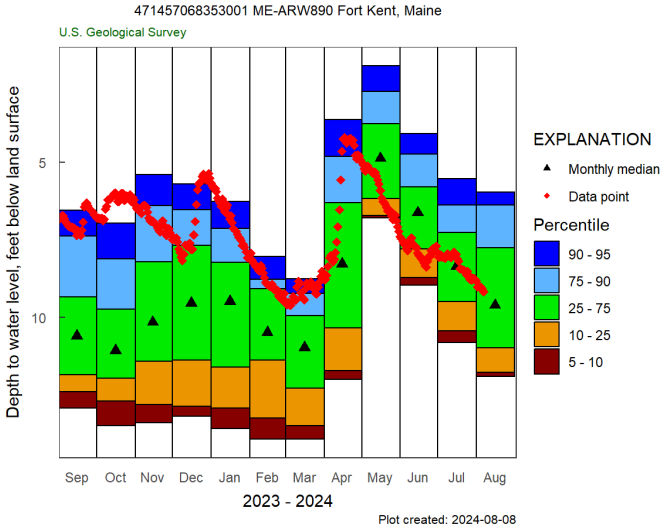
July Streamflows for Rivers

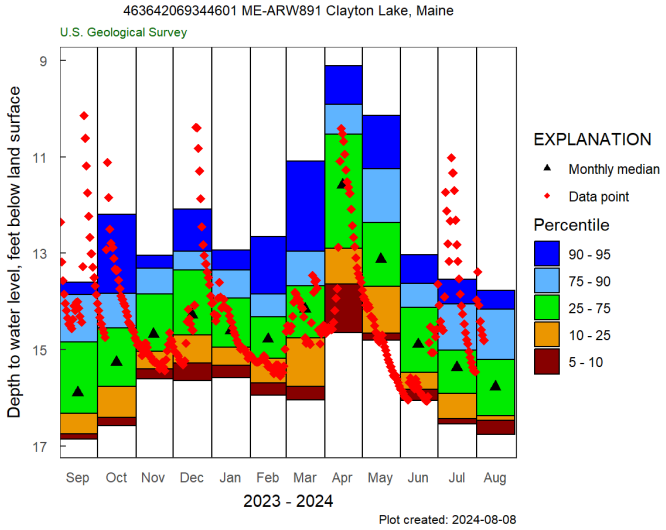
Data provided by the U.S. Geological Survey

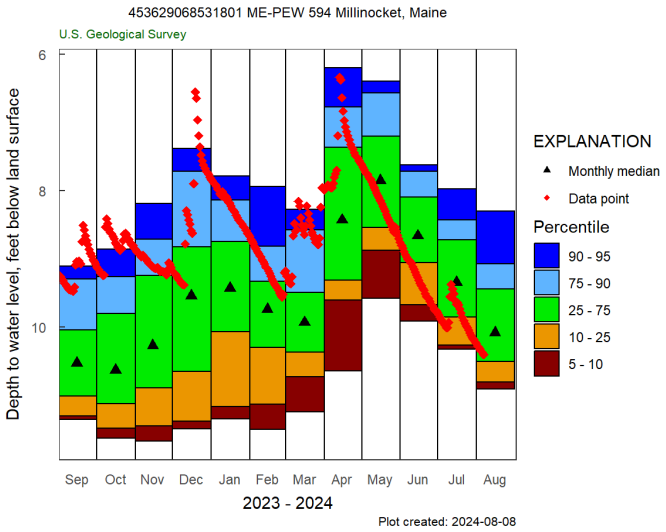
River	Monthly Mean Flow (cfs)	% Normal (mean)	Percentile Class	Drainage (mi^2)	Years of Record
Big Black River near Depot Mtn	264	135%	Normal	171	39
St. John River at Nine Mile Bridge	3731	258%	Much Above Normal	1341	72
Allagash River near Allagash	3115	224%	Much Above Normal	1478	93
St. John River at Dickey	5218	184%	Above Normal	2680	78
St. John River at Fort Kent	5137	81%	Normal	5929	96
Fish River near Fort Kent	514	53%	Below Normal	873	93
Aroostook River near Masardis	1047	148%	Above Normal	892	65
Aroostook River at Washburn	2493	183%	Above Normal	1654	92
St. Croix River at Vanceboro	254	32%	Much Below Normal	413	94
St. Croix River at Baring	495	28%	Low	1374	63
Grand Lake Stream at Grand Lake Stream	207	50%	Much Below Normal	228.3	94
Narraguagus River at Cherryfield	133	69%	Normal	227	75
East Branch Penobscot River at Grindstone	943	72%	Normal	837	101
Mattawamkeag near Mattawamkeag	1986	182%	Above Normal	1418	88
Piscataquis River near Dover-Foxcroft	851	344%	Much Above Normal	298	120
Sebec River at Sebec	1067	338%	Much Above Normal	326	68
Piscataquis River at Medford	3332	309%	Much Above Normal	1162	92
Penobscot River at West Enfield	11481	148%	Above Normal	6422	120

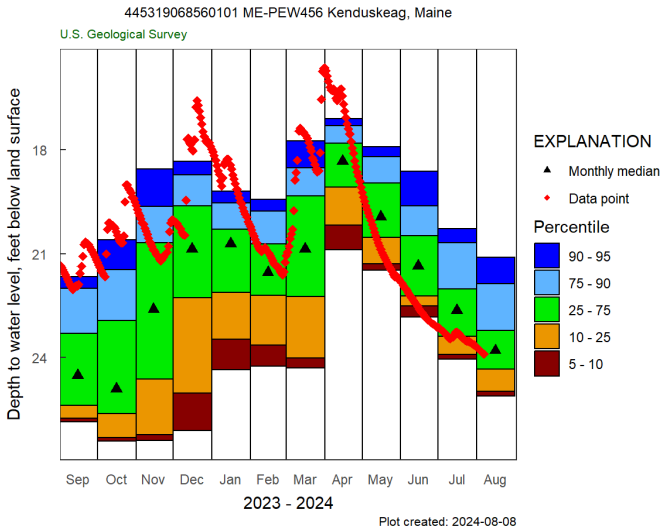
July Average Groundwater Levels

Station	Percentile Class	Years of Record
Hadley Lakes	Normal	38
Kenduskeag	Below Normal	45
Calais	Above Normal	24
Millinocket	Normal	29
Clayton Lake	Above Normal	45
Fort Kent	Normal	45









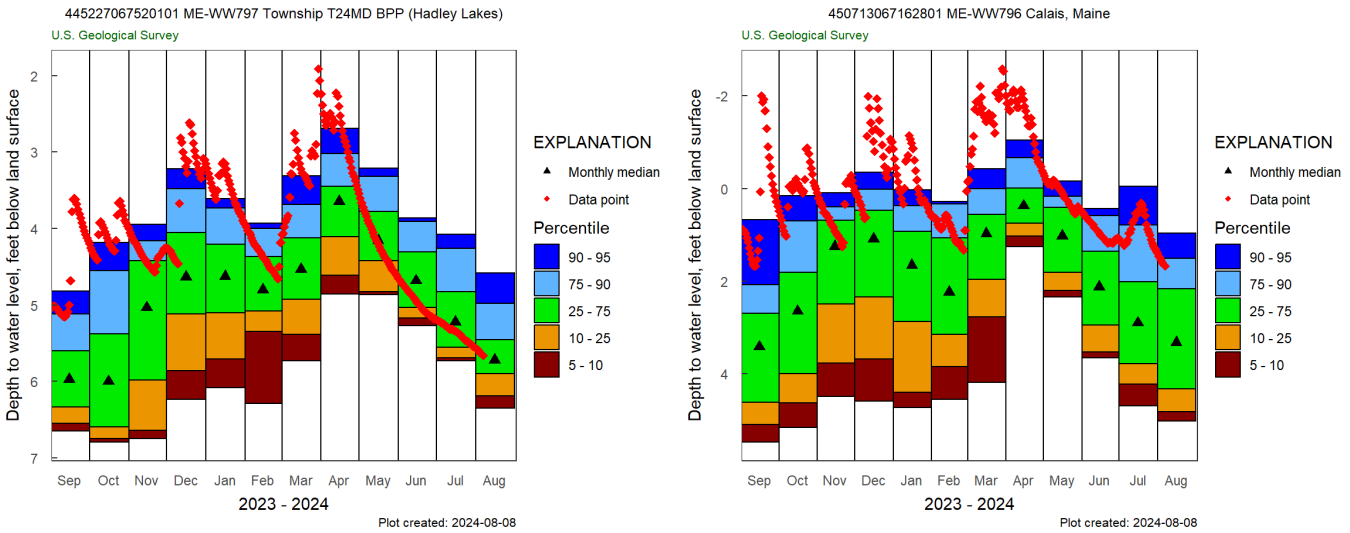


Figure 9-14: Groundwater Level Yearly Plots to Current
Source: United States Geological Survey

Flow or Water Level	Percentile Range	Explanation
Ice Impacted	NA	Ice impacted resulting in No Data available
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 from WFO Caribou, ME
July 2024

Product	How Many Issued	Reason for Issuance
Flood Watch	1	Excessive Rainfall
Flood Warning	1	Excessive Rainfall (Areal)
Flood Advisories	16	Excessive Rainfall (Thunderstorms)
Flash Flood Warnings	3	Excessive Rainfall (Thunderstorms)

July 10-11, 2024 Flooding Event

Synoptic Overview: The remnants of Beryl slowly propagated up along a stationary front draped across northern New England, funneling tropical moisture into the area with PWATs near all-time record for Maine. Due to the lingering boundary in the area, heavy, efficient rainfall would be exacerbated over a small region for an extended period of time, leading to the prolonged threat for flooding rains.

Heaviest Rainfall Totals

Aroostook County		**Piscataquis County**	
1 NNW Macwahoc	4.19 in	Abbot 4.6 WNW	5.20 in
4 SW Orient	3.00 in	4 WNW Abbot	4.88 in
1 E Orient	2.75 in	1 ENE Sebec	4.00 in
1 ESE Presque Isle	2.49 in	Kingsbury Precip	3.66 in
Caribou	2.18 in	East Sangerville	3.56 in
2 SSE Castle Hill	2.17 in	Greenville	2.75 in
Westfield NERON Site	1.51 in	Shirley	2.49 in
Clayton Lake	1.63 in	Churchill Dam	1.32 in
Hancock County		**N. Somerset County**	
1 S Orland	0.73 in	St. Zacharie Crossing	1.10 in
Penobscot County		**Washington County**	
3 ENE Lincoln	5.72 in	Vanceboro	3.02 in
0.9 N Lincoln	5.58 in	Danforth	2.64 in
2 NE Chester	4.20 in	Forest City	1.75 in
Millinocket	3.17 in	Eastport	1.34 in
Lincoln 5 SW	3.03 in	1.3 NE Topsfield	1.20 in
Enfield Cold Stream Pond	1.51 in		

Penobscot County Damage Photos (Special Thanks to Penobscot County EMA)

Area of 900 block of Route 2 Lincoln. CSX Railway.

Main St & Pleasant St - Lincoln

Main St & Pleasant St - Lincoln

Bangor Daily News Video of Sweet Road Lincoln Flooding:
https://www.facebook.com/reel/1018576823325166

West Broadway in Lincoln

Piscataquis County Damage Photos (Special Thanks to Piscataquis County EMA)

Major washout and flooding in Abbot on Bates Rd at Ladd Brook reported to EMA at 5am 45.219568, -69.461739

Bates Rd. Abbot. Underneath taking of this picture there are two 5' culverts that may have potentially failed. Water receding