

**MONTHLY REPORT OF HYDROLOGIC CONDITIONS**

**WFO Caribou, Maine**

REPORT FOR:  
MONTH YEAR

**July 2023**

SIGNATURE

**James Sinko - Meteorologist  
Hydrology Program Manager**

DATE

**August 15, 2023**

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

*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 2023**

July 2023 will be remembered for being warm, very humid and numerous rainfall events across the state. This was a result of the monthly average of the North Atlantic Oscillation (NAO) pattern of -2.17 standard deviation, while the Pacific North American (PNA) pattern at +1.15 standard deviation. This was the strongest NAO negative monthly mean in July since 2015 and the 4th strongest negative monthly mean in July dating back to 1950. Statistically July 2023 was a highly anomalous summer pattern thanks to the NAO negative index. Depicted below in the reanalysis of the monthly anomaly of the 500mb Geopotential Heights the blocking over the North Atlantic resulted in slightly higher heights over Eastern & Northern Maine. Thanks to the positive PNA and negative NAO combination, along with a rapid onset of El Nino pattern resulted in troughing over Maine with an active jet stream.

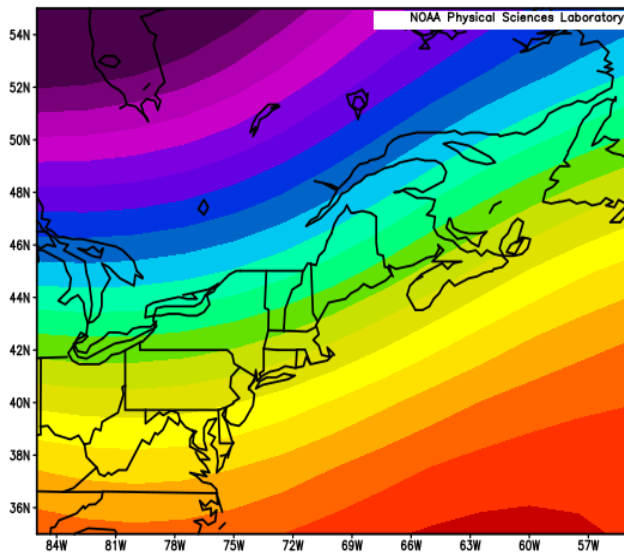


Figure 1: 500mb Geopotential Height (m) Anomalies (1991-2020 Climo) July 2023

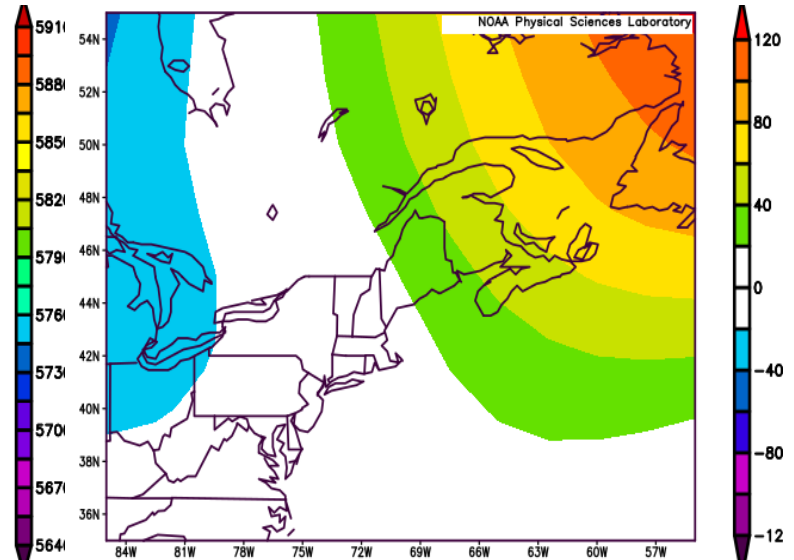


Figure 2: 500mb Geopotential Height (m) Composite Mean July 2023

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

**Precipitation Totals for Select Locations with all units in inches**

| <i>Location</i>   | <i>Total Precip</i> | <i>Normal Precip</i> | <i>Departure from Normal</i> | <i>% of Normal</i> | <i>Snowfall</i> | <i>Normal Snowfall</i> | <i>Departure from Normal</i> | <i>Greatest Snow Depth</i> | <i>Monthly Average Snow Depth</i> |
|-------------------|---------------------|----------------------|------------------------------|--------------------|-----------------|------------------------|------------------------------|----------------------------|-----------------------------------|
| Frenchville*      | 3.60                | 3.88                 | -0.28                        | 92.8%              |                 |                        |                              |                            |                                   |
| Fort Kent         | 4.32                | 4.52                 | -0.20                        | 95.6%              | 0.0             | 0.0                    | 0                            | 0                          | 0                                 |
| Van Buren         | 3.36                | 4.81                 | -1.45                        | 69.9%              | 0.0             | 0.0                    | 0                            | 0                          | 0                                 |
| Caribou           | 4.49                | 4.23                 | +0.26                        | 106.1%             | 0.0             | 0.0                    | 0                            | 0                          | 0                                 |
| Houlton           | 3.68                | 3.63                 | +0.05                        | 101.4%             |                 |                        |                              |                            |                                   |
| Millinocket*      | 4.75                | 4.16                 | +0.59                        | 114.2%             | 0.0             |                        |                              | 0                          | 0                                 |
| Greenville*       | 6.20                | 4.01                 | +2.19                        | 154.6%             |                 |                        |                              |                            |                                   |
| Moosehead*        | 5.03                | 4.03                 | +1.00                        | 124.8%             |                 |                        |                              |                            |                                   |
| Corinna           | 6.57                | 3.22                 | +3.35                        | 204%               |                 |                        |                              |                            |                                   |
| Bangor            | 3.98                | 3.16                 | +0.82                        | 125.9%             | 0.0             | 0.0                    | 0.0                          | 0                          | 0                                 |
| Grand Lake Stream | 5.97                | 3.29                 | +2.68                        | 181.4%             | 0.0             | 0.0                    | 0.0                          | 0                          | 0                                 |
| Robbinston*       | 4.11                | 3.18                 | +0.93                        | 129.2%             | 0.0             | 0.0                    | 0.0                          | 0                          | 0                                 |
| Topsfield*        | 5.76                | 3.84                 | +1.92                        | 150%               | 0.0             | 0.0                    | 0.0                          | 0                          | 0                                 |

*\*Millinocket snowfall measured at CoOp site, not the ASOS site. Departure data is not available. \*Moosehead Site is in GYX CWA  
 \*Topsfield Records date back to 2000, \*Robbinston Records date back to 1994, \*Greenville data gap between 1975 and 1999*

**Rainfall** across the region this month as typical for summer months was somewhat patchy, ranging from as low as 80% across portions of the north and Penobscot Bay area upwards to locally 200% of average across some East Central locations. The climate sites ranged from 90-140% of average, with none recording top 15 maximum totals for July. The July 2023 total pan evaporation of 5.05 inches at Caribou was greater than rainfall at most locations within the region, meaning soils had a chance to dry out some from last month's heavy rainfall. There were several events requiring the issuances of flood headlines including watches, warnings and advisories. Afternoon thunderstorms prompted flash flood warnings on July 4-7th and then again on the 9th. On July 3rd a flood watch for flash flooding was in effect and we saw widespread 1-2 inches across the Downeast and Central Highlands but thankfully no flooding was reported. On July 4th late evening a cluster of thunderstorms developed nocturnally along the New Brunswick border near Caribou & Fort Fairfield where radar showed rainfall rates of 1-2 inches per hour as the storms moved slowly south. Only reports we received were of excessive runoff of farm fields resulting in washed gravel across roads.

Only July 5th strong to severe storms across Washington county were producing 1.5-3 inches based on radar data mostly over rural areas, no reports were received. On July 7th numerous afternoon thunderstorms developed across the area with soaked soils which resulted in the need of a flash flood warning. In addition a missed flash flood event occurred in Baxter State Park where 2-3 inches of rain fell in a short period of time causing rapid rise on Nesowadnehunk Stream flooding the Park Tote Road with 8-10 inches of running water.

Multiple thunderstorms resulted in a couple heavy totals including Castle Hill with 1.63 inches and Limestone with 1.46 inches. Slow moving training thunderstorms prompted a Flash Flood Warning in Northern Somerset county on July 9th when a rural area reached 200-300% of flash flood guidance with CREST values reaching 800-900 cfs/sq mi with a max CREST of 1097.57 cfs/ sq mi. This occurred in a very rural area of the North Woods and no reports were ever received to confirm any impacts. On July 16th a flood watch was in effect for excessive rainfall and a flash flood warning was prompted when reports were received of Route 16 south of Sebec flooding and beginning to washout. Later got a report from the local fire department to confirm it was a beaver dam collapse that caused the flooding.

**Streamflows** due to numerous thunderstorms and rainfall events resulted in most rivers above to well above normal especially in western and northern zones. Downeast with the lack of widespread rainfall the flows were normal to much below normal.

**Groundwater** by the end of the month was running 1-2 inches above climatology average with soil moisture values as depicted by the Climate Prediction Center ranging from 20-24 inches. By the end of the month groundwater monitoring sites reported Normal at Clayton Lake to Above Normal in the rest of Northern, Central and Downeast Maine. In fact, in Calais the observing site was the highest ever recorded during the period of record (23 years of data).

**Temperatures** after a relatively cool May and June the temperatures across the region in July ranged from 3 to 5 degrees above average with the highest departures across the North. In fact, July 2023 was the warmest July on record at Caribou, breaking the previous record of 70.9 degrees set in 2018. Houlton was the 2nd warmest July on record with 71.2°F, in Millinocket it was also 2nd warmest July at 72.4°F. In Bangor it was the 4th warmest July at 73.0°F for the average monthly temperature. It's interesting to note that overnight low temperature departures were more responsible for the warmth of this month than daytime highs. For instance, at Caribou, the average maximum temperature for July 2023 of 80.6 degrees was 4th warmest, finishing behind the previous warmest, July 2018 average max temp of 82.4 degrees. The average minimum temperature of 62.4 degrees, however, outpaced the prior highest average minimum temperature 59.9 degrees from July 2020 by a little more margin than the difference in average maximum high temps from the first and second place finishers, resulting in July 2023 being the new average temperature record holder. The key to very warm overnight low temps this month, especially across the north, was a continued south to southwest wind flow with no significant cold frontal passages until the end of the month. This resulted in many days with humid dew point temperatures of mid to upper 60s and even a few days with very tropical dew points into the lower 70s with very little breaks. The first significant cold front passage resulted in cooler daytime temps accompanied by dewpoints of 50s or less from the 29th-31st of the month.

| <i>Town/City</i>         | <i>Avg Monthly Temperature (°F)</i> | <i>Normal Monthly Temperature (°F)</i> | <i>Departure from Normal (°F)</i> |
|--------------------------|-------------------------------------|--|-----------------------------------|
| <b>Frenchville</b>       | 70.6                                | 66.1                                   | +4.5                              |
| <b>Fort Kent</b>         | 69.7                                | 64.8                                   | +4.9                              |
| <b>Van Buren</b>         | 71.7                                | 65.7                                   | +6.0                              |
| <b>Caribou</b>           | 71.5                                | 66.7                                   | +4.8                              |
| <b>Houlton</b>           | 71.2                                | 66.1                                   | +5.1                              |
| <b>Millinocket</b>       | 72.4                                | 68.2                                   | +4.2                              |
| <b>Greenville*</b>       | 70.0                                | 66.3                                   | +3.7                              |
| <b>Moosehead</b>         | 69.4                                | 65.3                                   | +4.1                              |
| <b>Corinna</b>           | 72.4                                | 69.2                                   | +3.2                              |
| <b>Bangor</b>            | 73.0                                | 69.5                                   | +3.5                              |
| <b>Grand Lake Stream</b> | 71.5                                | 68.0                                   | +3.5                              |
| <b>Robbinston*</b>       | 68.5                                | 66.5                                   | +2.0                              |
| <b>Topsfield*</b>        | 71.7                                | 67.6                                   | +4.1                              |

*\*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*

In regards to **Drought** monitoring there was no drought classification for the month of July.

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

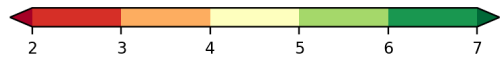
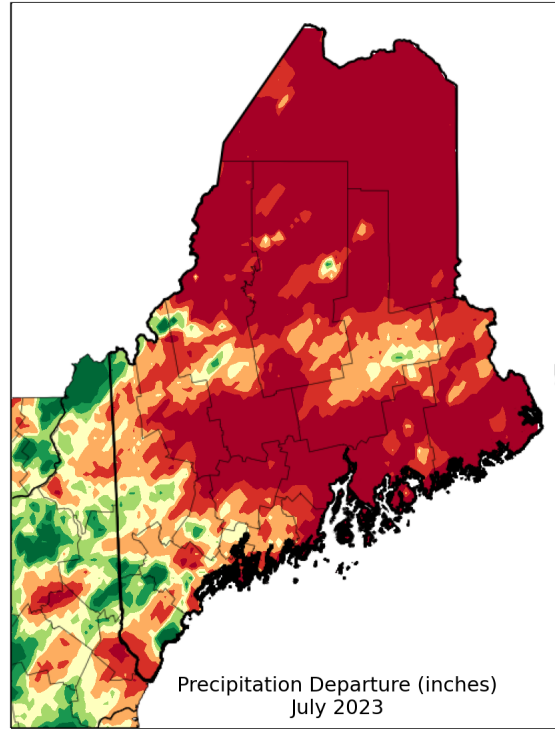
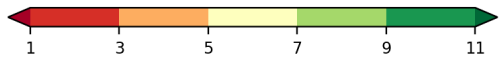
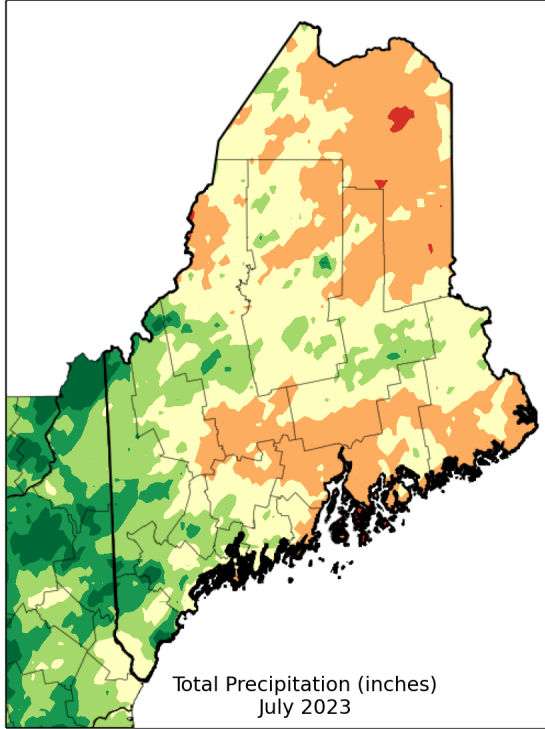


Figure 3: Monthly Precipitation Totals for July 2023

Figure 4: Monthly Precipitation Departures from Normal for July

Source: [Northeast Regional Climate Center](#)

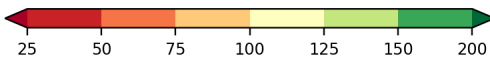
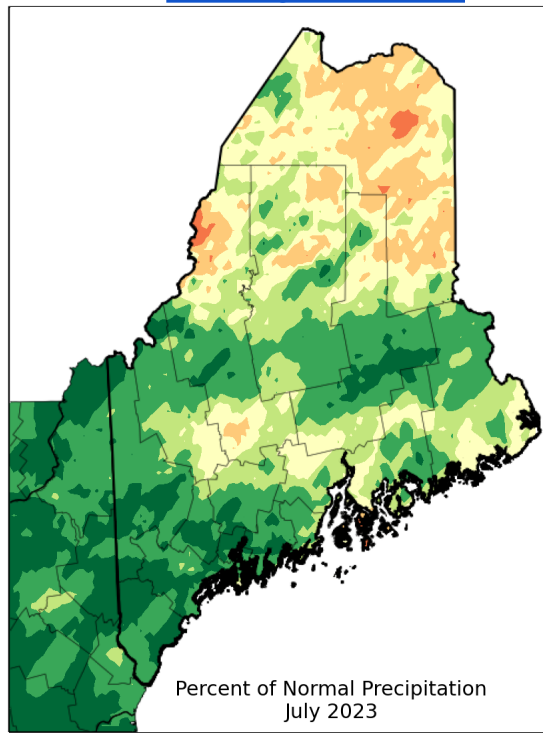


Figure 5: Percent of Normal Precipitation July 2023

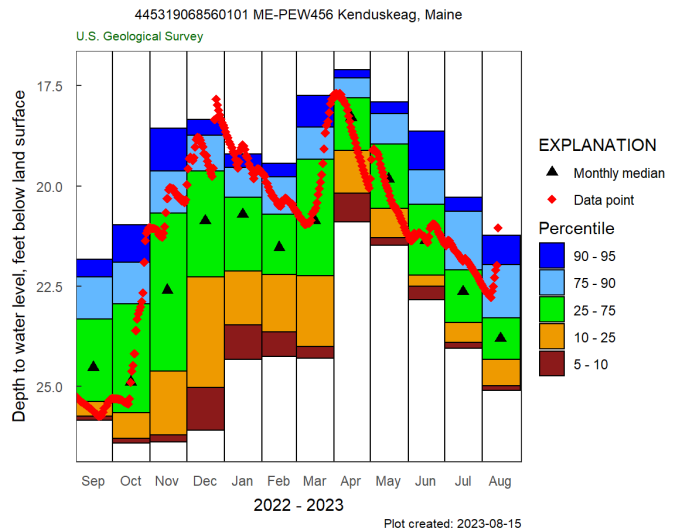
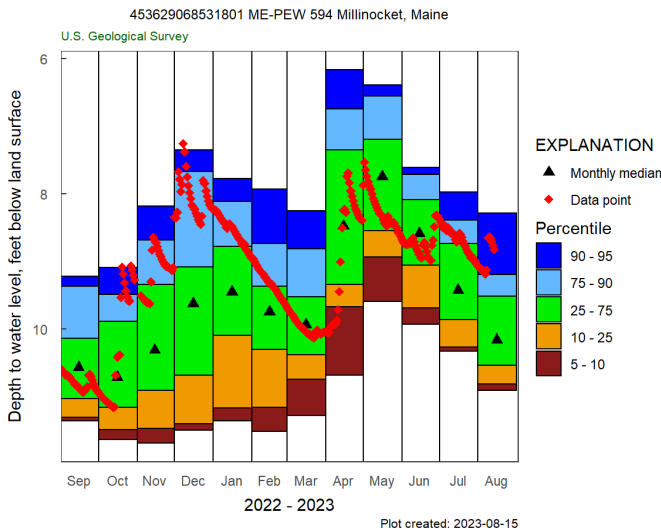
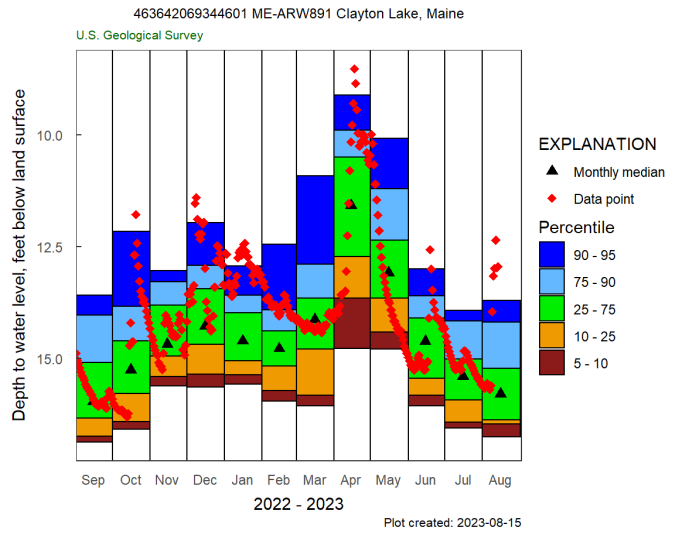
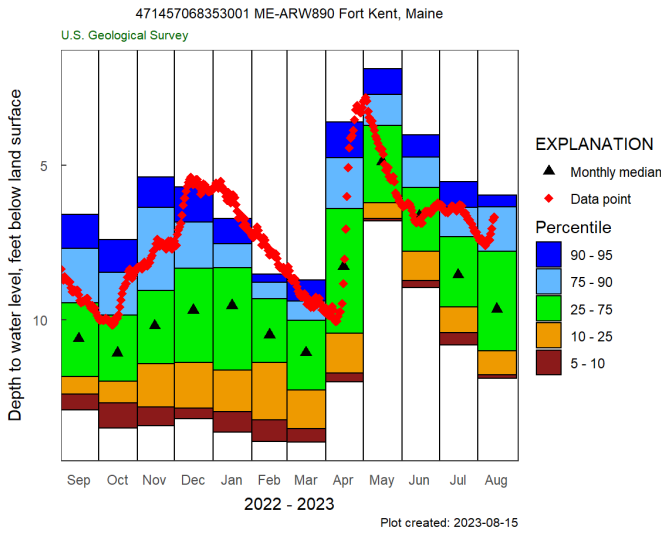
Source: [Northeast Regional Climate Center](#)

### July Streamflows for Rivers

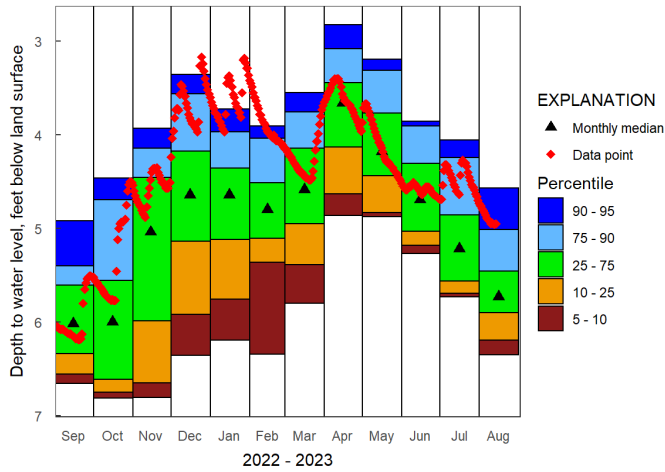
| River                                     | Monthly Mean Flow (cfs) | % Normal (mean) | Percentile Class  | Drainage (mi <sup>2</sup> ) | Years of Record |
|---|-------------------------|-----------------|-------------------|-----------------------------|-----------------|
| Big Black River near Depot Mtn            | 195.56                  | 100.06%         | Normal            | 171                         | 39              |
| St. John River at Nine Mile Bridge        | 2000.61                 | 138.20%         | Above Normal      | 1341                        | 72              |
| Allagash River near Allagash              | 2055.16                 | 147.82%         | Above Normal      | 1478                        | 93              |
| St. John River at Dickey                  | 3862.26                 | 136.51%         | Above Normal      | 2680                        | 78              |
| St. John River at Fort Kent               | 4798.21                 | 75.71%          | Normal            | 5929                        | 96              |
| Fish River near Fort Kent                 | 795.32                  | 81.82%          | Normal            | 873                         | 93              |
| Aroostook River near Masardis             | 1327.16                 | 188.16%         | Above Normal      | 892                         | 65              |
| Aroostook River at Washburn               | 2215.13                 | 162.25%         | Above Normal      | 1654                        | 92              |
| St. Croix River at Vanceboro              | 371.57                  | 46.25%          | Much Below Normal | 413                         | 94              |
| St. Croix River at Baring                 | 1390.23                 | 79.79%          | Normal            | 1374                        | 63              |
| Grand Lake Stream at Grand Lake Stream    | 216.76                  | 52.07%          | Below Normal      | 228.3                       | 94              |
| Narraguagus River at Cherryfield          | 510.52                  | 262.21%         | Much Above Normal | 227                         | 75              |
| East Branch Penobscot River at Grindstone | 2591.94                 | 197.99%         | Much Above Normal | 837                         | 101             |
| Mattawamkeag near Mattawamkeag            | 2260.65                 | 207.33%         | Above Normal      | 1418                        | 88              |
| Piscataquis River near Dover-Foxcroft     | 872.97                  | 353.09%         | Much Above Normal | 298                         | 120             |
| Sebec River at Sebec                      | 1037.32                 | 328.65%         | Much Above Normal | 326                         | 68              |
| Piscataquis River at Medford              | 3305.10                 | 306.93%         | Much Above Normal | 1162                        | 92              |
| Penobscot River at West Enfield           | 14829.03                | 190.96%         | Much Above Normal | 6422                        | 120             |

## June Average Groundwater Levels

| Station      | Percentile Class | Years of Record |
|--------------|------------------|-----------------|
| Hadley Lakes | Above Normal     | 37              |
| Kenduskeag   | Above Normal     | 45              |
| Calais       | High             | 23              |
| Millinocket  | Above Normal     | 29              |
| Clayton Lake | Above Normal     | 44              |
| Fort Kent    | Above Normal     | 45              |

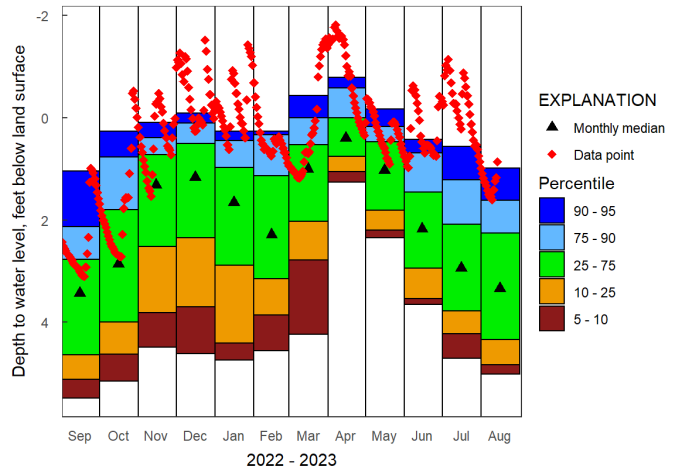


445227067520101 ME-WW797 Township T24MD BPP (Hadley Lakes)  
U.S. Geological Survey



Plot created: 2023-08-15

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



Plot created: 2023-08-15

Figure 6-11: Groundwater Level Yearly Plots to Current  
Source: [United States Geological Survey](https://www.usgs.gov/)

| Flow or Water Level | Percentile Range                      | Explanation  |
|---------------------|---------------------------------------|--|
| Low                 | 0 <sup>th</sup>                       | 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 <sup>th</sup> to 10 <sup>th</sup>   | The monthly mean streamflow or median water level during this month is less than the 10 <sup>th</sup> percentile when compared to all of the months during the period of record for this site.                     |
| Below normal        | 10 <sup>th</sup> to 25 <sup>th</sup>  | The monthly mean streamflow or median water level during this month is between the 10 <sup>th</sup> and 25 <sup>th</sup> percentiles when compared to all of the months during the period of record for this site. |
| Normal              | 25 <sup>th</sup> to 75 <sup>th</sup>  | The monthly mean streamflow or median water level during this month is between the 25 <sup>th</sup> and 75 <sup>th</sup> percentiles when compared to all of the months during the period of record for this site. |
| Above normal        | 75 <sup>th</sup> to 90 <sup>th</sup>  | The monthly mean streamflow or median water level during this month is between the 75 <sup>th</sup> and 90 <sup>th</sup> percentiles when compared to all of the months during the period of record for this site. |
| Much above normal   | 90 <sup>th</sup> to 100 <sup>th</sup> | The monthly mean streamflow or median water level during this month is greater than the 90 <sup>th</sup> percentile when compared to all of the months during the period of record for this site.                  |
| High                | 100 <sup>th</sup>                     | 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 July 2023 WFO Caribou, ME

| Product             | How Many Issued | Reason for Issuance                     |
|---------------------|-----------------|---|
| Flash Flood Warning | 5               | Excessive Rainfall due to Thunderstorms |
| Flood Advisory      | 22              | Excessive Rainfall due to Thunderstorms |
| Flood Watch         | 3               | Excessive Rainfall due to Thunderstorms |





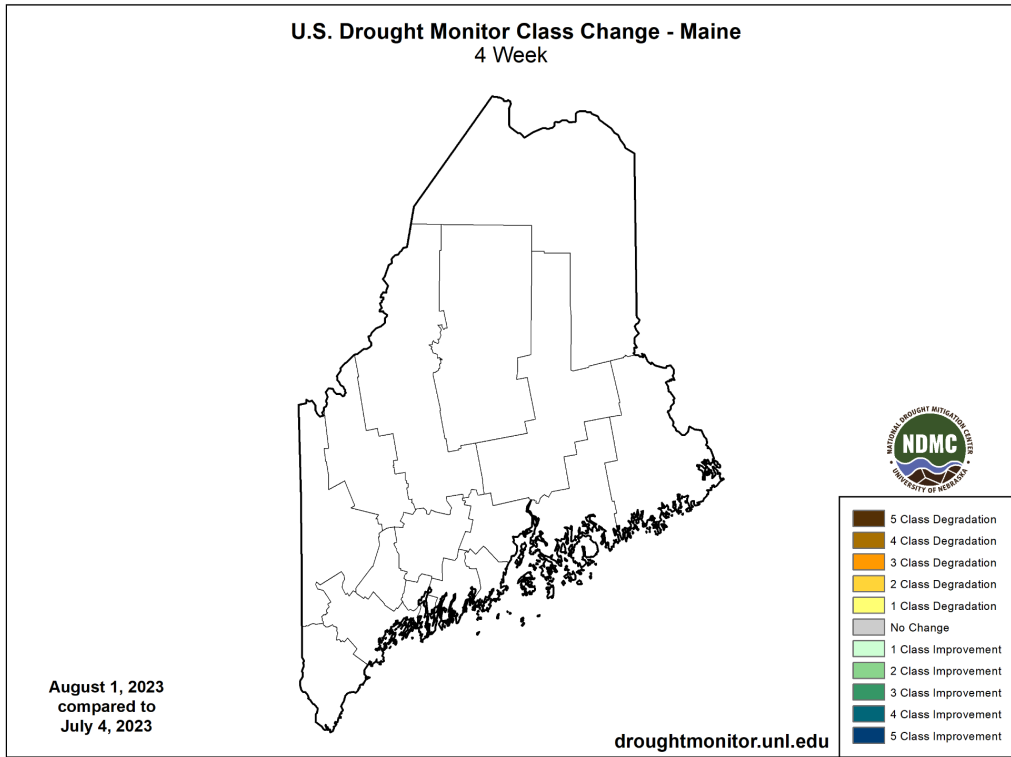


Figure 12-14: U.S. Drought Monitor Drought Classification & Statistics for May  
Source: [U.S. Drought Monitor](https://droughtmonitor.unl.edu)