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 **September 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 **October 6, 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).

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

September 2024

September 2024 was significantly warmer and much drier than average across all of Northern and Eastern Maine. The North Atlantic Oscillation (NAO) monthly mean completely flipped from August 2024 to a monthly mean of -1.43 SD as the Pacific North American Pattern (PNA) completely flipped positive to a monthly mean of +1.34 SD. This resulted in a significant change in the pattern compared to the previous month in North America. The El Niño-Southern Oscillation (ENSO) pattern remains ENSO Neutral as the Niño 1+2 SST departures sit at -0.6°C and the Niño 3 region was -0.1°C with Niño 3.4 region at -0.4°C. The overall mean flow at 500mb was mainly zonal but heights were higher than typical for September. Blocking upper level high pressure prevailing especially mid to late month mostly prevented moisture laden low pressure and frontal systems from affecting the area. The persistent high pressure is noticeable in the sea level pressure anomalies with positive anomalies over Maine. Overall, significant pattern shifts result in abnormal conditions, which for September 2024 was the lack of precipitation.

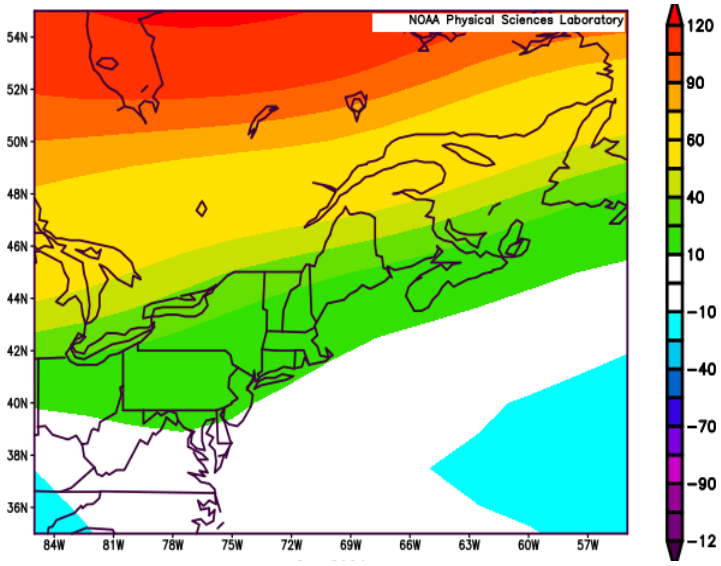


Figure 1: 500mb Geopotential Height (m) Anomalies *(1991-2020 Climo)* September 2024

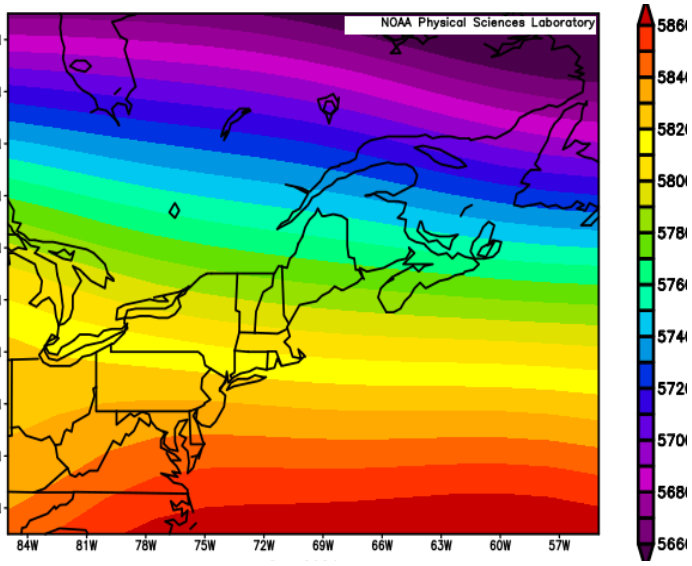


Figure 2: 500mb Geopotential Height (m) Composite Mean September 2024

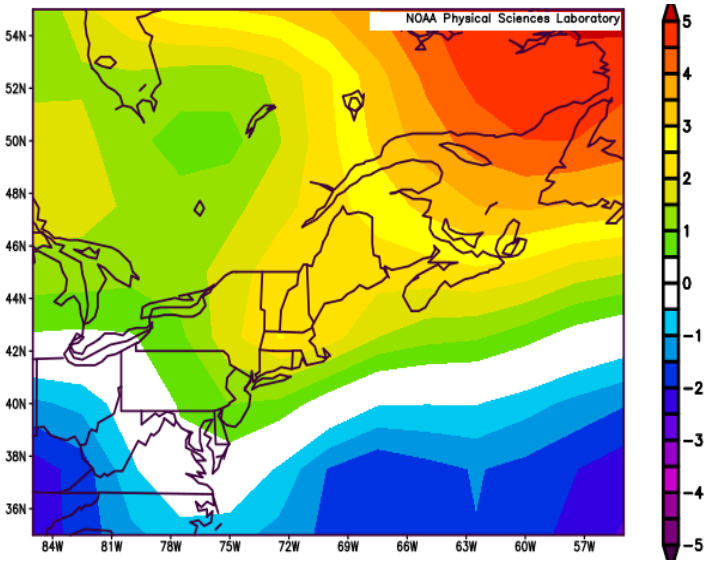


Figure 3: Sea Level Pressure (mb) Anomalies *(1991-2020 Climo)* September 2024

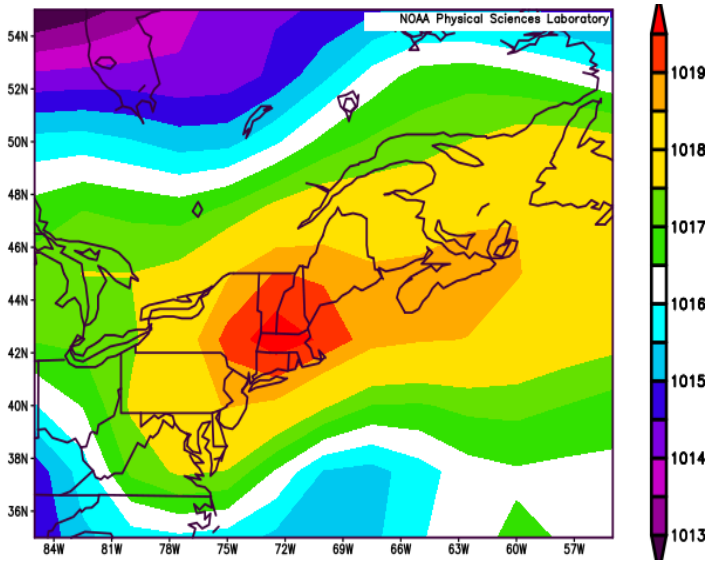


Figure 4: Sea Level Pressure (mb) Composite Mean September 2024

Figure 1-4 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*	1.12	3.46	**-2.34**	32.4%					
Fort Kent	1.55	3.72	**-2.17**	41.7%	0.0	0.0	0.0	0	0.0
Van Buren	1.03	3.83	**-2.80**	26.9%	0.0	0.0	0.0	0	0.0
Caribou	0.93	3.44	**-2.51**	27.0%	0.0	0.0	0.0	0	0.0
Houlton	0.99	3.40	**-2.41**	29.1%					
Millinocket*	0.94	3.61	**-2.67**	26.0%	0.0			0	0.0
Greenville*	1.35	3.44	**-2.09**	39.2%					
Moosehead*	1.55	3.42	**-1.87**	45.3%	0.0	0.0	0.0	0	0.0
Corinna	1.14	3.56	**-2.42**	32.0%	0.0	0.0	0.0	0	0.0
Bangor	1.33	3.76	**-2.43**	35.4%	0.0	0.0	0.0	0	0.0
East Surry	1.29	3.92	**-2.63**	32.9%	0.0	0.0	0.0	0	0.0
Robbinston*	1.03	4.23	**-3.20**	24.3%	0.0	0.0	0.0	0	0.0
Topsfield*	1.32	4.01	**-2.69**	32.9%	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. *Baileyville is a partial complete record to 1917. *Frenchville ASOS has documented issues with precipitation measurements in the winter months.*

Precipitation was the story of the month in September. It was a very dry month across the region, with only 25 to 35 percent of normal September rainfall recorded except locally upwards to 50 to 60 percent of normal over the far northwest. Blocking upper level high pressure prevailing especially mid to late month mostly prevented moisture

laden low pressure and frontal systems from affecting the area. The exception was the system on the 26th which resulted from 0.50 to 1.00 inch of rainfall at the climate sites and upwards to 2.00 inches over the far northwest, preventing September 2024 being the driest of record. Even so, it was the 2nd driest September on record at Caribou with 0.93 inch total which fell short of the 0.83 inch record of 1968. At Millinocket and Houlton it was 4th driest (with Houlton tying September 2016) and 13th driest at Bangor. Using the 30 day Standardized Precipitation Index (SPI) we see that much of the area was 1 to 2 standard deviations below normal indicating moderate to severe dryness.

Monthly **Evaporation** at the National Weather Service Weather Forecast Office in Caribou was 3.07 inches with only 0.93 inches of precipitation. This was a significant period of dry conditions across much of the State of Maine. This did result in lawns turning brown by late in the month over the Central Highlands and Downeast areas which was abnormal given that we haven't experienced a frost/freeze anywhere to date. By the end of the month, the **Drought** Monitor rated Northeast and Central areas as abnormally dry with moderate drought rated over some Downeast areas. This was a rapid onset drought or sometimes referred to as a "Flash Drought". It is interesting to note, preliminary data from the Maine Forest Service shows 25 wildfire incidents occurred in September across Eastern & Northern Maine. Thankfully, nearly all of them were kept to less than 0.1 acres burned but one fire in Downeast was preliminarily 3.4 acres. September was an uptick compared to July and August combined but this probably was aided by the dry conditions with 16 of these 25 fires in Downeast dry areas.

Streamflows experienced a significant impact from the prolonged dry conditions across Eastern and Northern Maine in September. Streamflow started the month above normal across the upper St. John basin and near to below normal for the lower basin. Normal conditions on the Aroostook basin along with the Penobscot basin. Above normal conditions on the Piscataquis and Below Normal on the St. Croix basin. This dramatically changed through the month with streamflows rapidly falling below normal conditions. By the end of the month most river gages in Eastern and Northern Maine were running Below Normal to Much Below Normal for September and this is typically the lowest streamflow time of year. The St. John River finished normal in the headwaters including the Dickey/Allagash Region. The St. John River gages from Fort Kent east indicate Below Normal conditions stretched downstream to Hamlin. The Aroostook River as a monthly mean was also significantly below normal in the 10-24th percentile range which observations confirmed many river islands were noticeable that typically are underwater. It is important to note that on the weekend of the 20th-22nd operators of the Tinker Dam in New Brunswick had to lower the headpond of the Aroostook River 10 feet to install new intake gates. This did result in much lower water levels from the Caribou Dam downstream to Fort Fairfield. Below Normal conditions in the 10-24th percentile range were noted as monthly means for the Piscataquis River basin and the upper Penobscot Basin. Water retention behind Ripogenus Dam had fallen to near 15BCF which for late September is approaching the bottom end of the "normal range" and nearing the higher end of the "dry range". The Penobscot water storage as a whole finished the month at 58.4% full which was 6.8% below the long term normal. It is important to note that the West Enfield river gage which is below the confluence with the Piscataquis fell to below the 10th percentile which indicates Much Below Normal conditions. Looking at the St. Croix basin, although heavily regulated by dams, the conditions remain very low as water continues to be held back in head ponds and lakes which is typical for summer but still were significantly below normal. The Grand Lake Stream at Grand Lake Stream which is below the Dam was at near record low flow as a monthly mean. The St. Croix River at Baring was near record low flow for a monthly mean. The St. Croix River at Vanceboro was Much Below Normal below the 10th percentile threshold.

Groundwater started to be impacted through the month with some sites more noticeable than others. Millinocket started the month in the 25-40th percentile range which was normal but fell to the 5-10th percentile range which is Much Below Normal conditions. Conditions were deteriorating in the Downeast with Hadley Lakes groundwater

site starting around the Monthly Median but falling to the 15-20th percentile which is Below Normal conditions. Although the remaining sites in Fort Kent, Clayton Lake, Kenduskeag and Calais were normal conditions the plots seen below indicate the signs that the dry conditions have impacted the groundwater.

Soil Moisture conditions (Regression Kriging Interpolation) in the top 2 inches started the month with soil moisture 75-90th percentile across Eastern Aroostook County and St. John Valley. Most of Eastern, Central and Downeast Maine were around normal conditions with 20-30th percentile below normal conditions along the Downeast shoreline in Hancock and Washington counties. By the end of the month much of the Downeast coast, interior Downeast and Greater Bangor area sits in the 20-30th percentile which is contributing to the reports of brown grass. Elsewhere, the top 2 inches are generally around normal for the end of September 2024. By the end of the month the Surface to 8 inch deep soil moisture statewide was in the 5th-10th percentile indicating very dry conditions. Lastly, the surface to 20 inch depth moisture levels were above normal across the north with normal conditions elsewhere to start September. However, by the end of the month even the deep soil moisture levels dropped to the 50th percentile which is normal conditions compared to the beginning of the month.

Temperatures across the region ranged from 1.0 to 2.0 degrees above normal over Downeast areas upwards to 2.5 to 3.5 degrees above normal over Central / Northern areas. This made September 2024 the 5th warmest on record for Caribou and Millinocket and 6th warmest at Houlton. The month began on a relatively cool note through the first 11 days, but then dramatically warmed mid month especially the 16th-19th with most low terrain locations inland from the immediate coast well into the 80s. Temperatures returned closer to normal for the remainder of the month. Coolest morning lows reached mid to upper 30s at a few of the cooler northern valley sites on the 4th, 8th, 10th, 15th, 24th, and 25th with no documented freezes or widespread killing frosts. At the conclusion of September, the total 2024 warm season tally of 80+ degree high temperature days amongst the climate sites ranged from 46 at Houlton upwards to 57 at Millinocket. The total of 49 at Caribou was the 4th greatest, while 57 at Millinocket was 7th greatest, and 46 at Houlton was the 12th greatest. The total of 56 at Bangor did not make the top 15, with the greatest number 80+ degree high temperature days there being 87, recorded in the dust bowl warm season years of 1930 and 1937.

Town/City	Avg Monthly Temperature (°F)	Normal Monthly Temperature (°F)	Departure from Normal (°F)
Frenchville	59.4	56.1	**3.3**
Fort Kent	57.4	54.3	**3.1**
Van Buren	58.1	55.4	**2.7**
Caribou	59.9	56.6	**3.3**
Houlton	58.7	56.2	**2.5**
Millinocket	61.3	58.2	**3.1**
Greenville*	59.9	57.2	**2.7**
Moosehead	58.4	56.0	**2.4**
Corinna	61.0	59.8	**1.2**
Bangor	61.5	59.9	**1.6**
East Surry	60.0	59.3	**0.7**
Robbinston*	61.8	59.0	**2.8**
Topsfield*	61.3	58.3	**3.0**

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

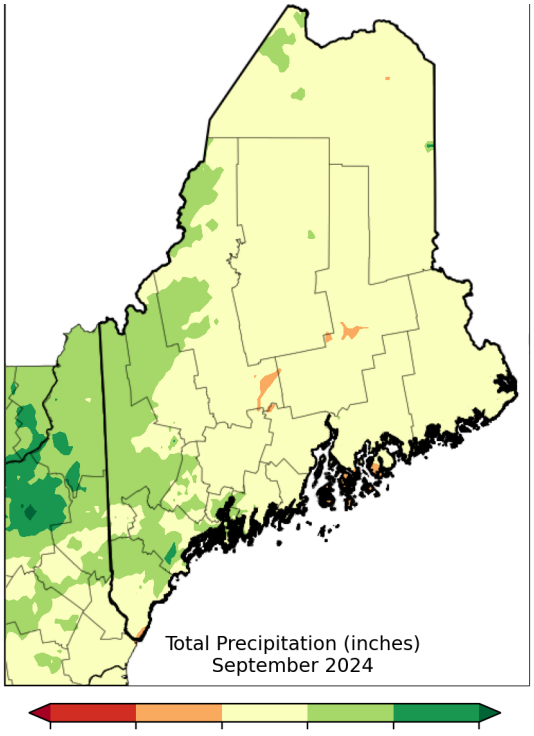


Figure 5: Total Liquid Precipitation for September

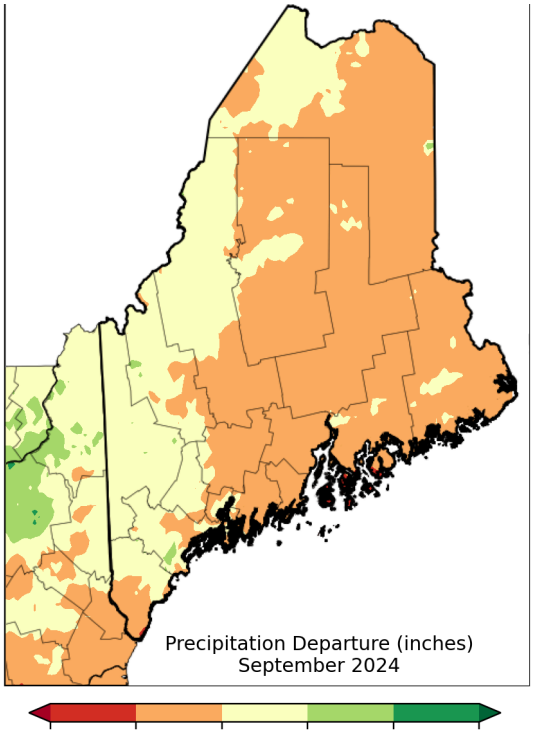


Figure 6: Liquid Precipitation Departure for September

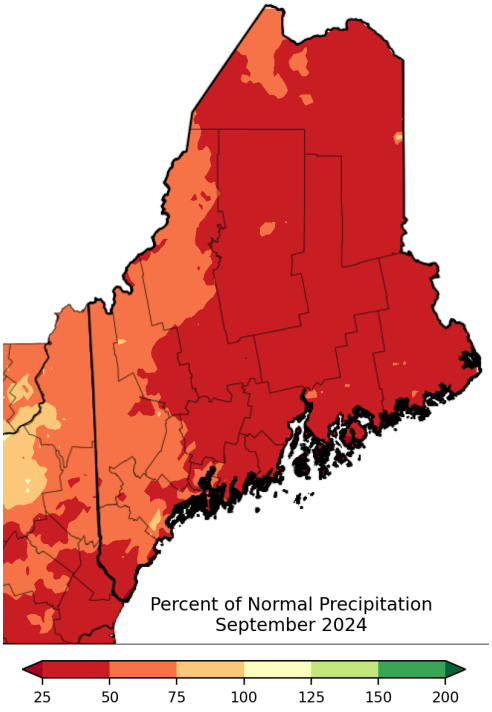


Figure 7: % of Normal Precipitation for September

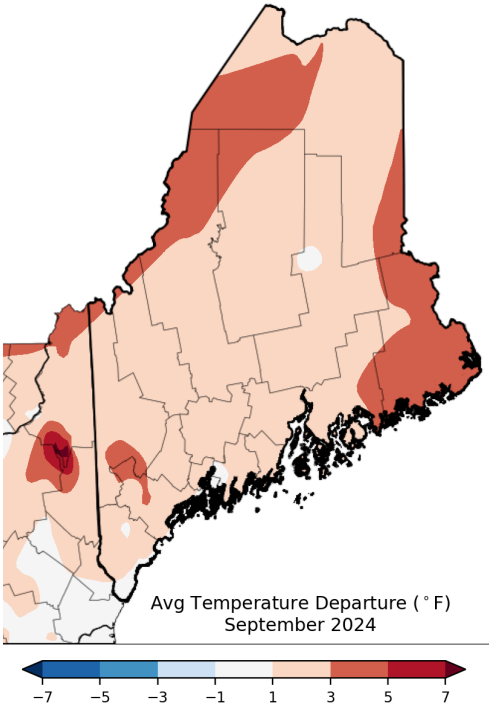


Figure 8: Average Temperature Departure for September

Source: Northeast Regional Climate Center

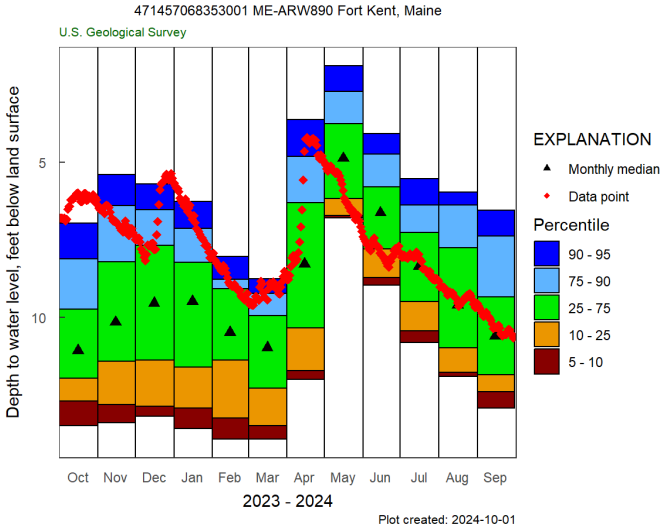
September Average Monthly Streamflows

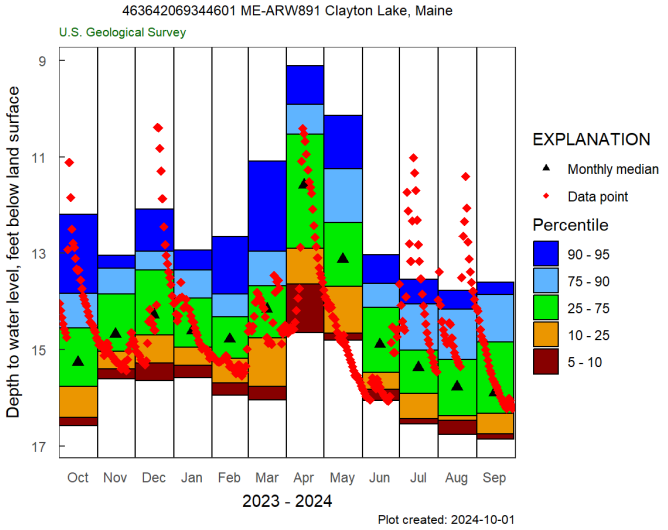
Data provided by the U.S. Geological Survey

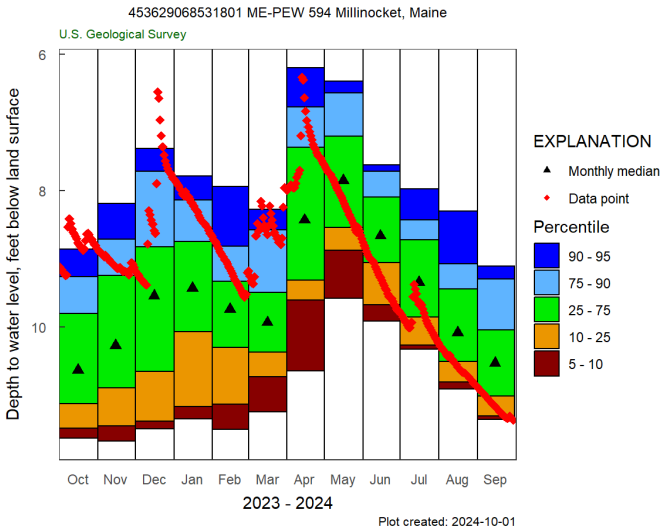
River	Monthly Mean Flow (cfs)	% Normal (mean)	Percentile Class	Drainage (mi^2)	Years of Record
Big Black River near Depot Mtn	62	46%	Normal	171	40
St. John River at Nine Mile Bridge	593	46%	Normal	1341	73
Allagash River near Allagash	754	72%	Normal	1478	94
St. John River at Dickey	1080	46%	Normal	2680	79
St. John River at Fort Kent	1359	29%	Below Normal	5929	97
Fish River near Fort Kent	152	26%	Below Normal	873	94
Aroostook River near Masardis	163	24%	Below Normal	892	66
Aroostook River at Washburn	345	30%	Below Normal	1654	93
St. Croix River at Vanceboro	222	31%	Much Below Normal	413	95
St. Croix River at Baring	502	29%	Low	1374	64
Grand Lake Stream at Grand Lake Stream	82	19%	Low	228.3	95
Narraguagus River at Cherryfield	42	24%	Below Normal	227	76
East Branch Penobscot River at Grindstone	464	47%	Below Normal	837	102
Mattawamkeag near Mattawamkeag	140	16%	Below Normal	1418	89
Piscataquis River near Dover-Foxcroft	54	28%	Below Normal	298	121
Sebec River at Sebec	135	36%	Below Normal	326	69
Piscataquis River at Medford	373	39%	Below Normal	1162	93
Penobscot River at West Enfield	3866	57%	Much Below Normal	6422	121

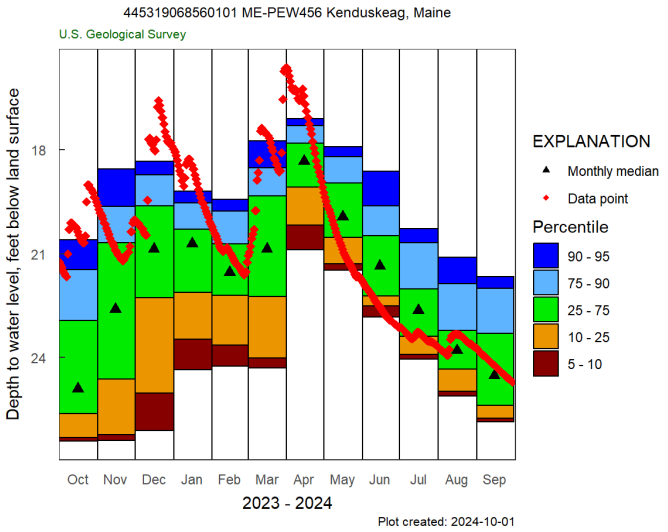
September Average Groundwater Levels

Station	Percentile Class	Years of Record
Hadley Lakes	Normal	39
Kenduskeag	Normal	43
Calais	Above Normal	42
Millinocket	Below Normal	30
Clayton Lake	Normal	35
Fort Kent	Normal	46









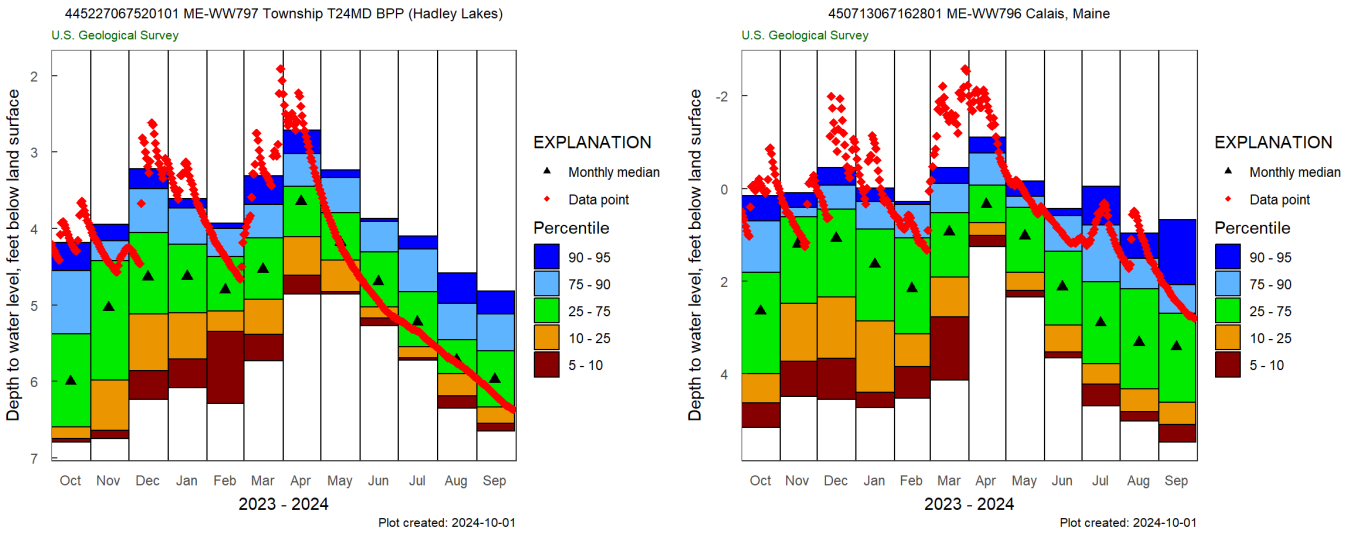


Figure 9-14: Groundwater Level Yearly Plots to Current
Source: United States Geological Survey

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
September 2024

None issued.

CoCoRaHS Complete Precipitation Reports
www.cocorahs.org
September 2024

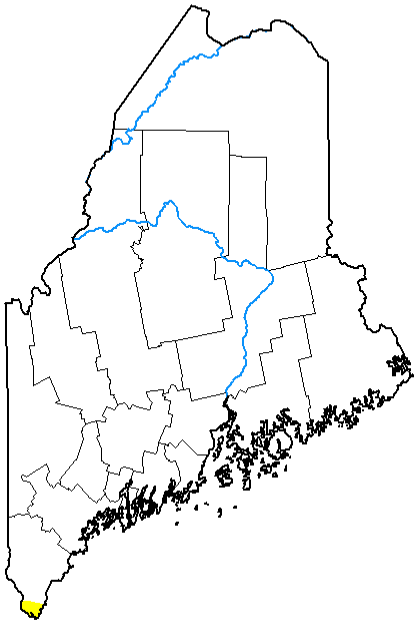
Station Number	Station Name	Total Precipitation (inches)
ME-AR-15	Presque Isle 1.3 WSW	1.69
ME-AR-18	New Sweden 4.9 NNW	1.31
ME-AR-28	Presque Isle 4.2 S	1.32
ME-AR-40	Houlton 2.2 SW	1.11
ME-AR-41	Castle Hill 1.0 S	1.36
ME-HN-2	East Surry	1.29
ME-HN-4	Mariaville 1.4 ESE	1.56
ME-HN-26	Brooklin 2.8 SE	1.72
ME-PN-59	Glenburn 2.0 ESE	1.49
ME-PS-9	Abbot 4.6 WNW	1.46
ME-WS-11	Whiting 2.3 WSW	1.37
ME-WS-31	Eastport 1.4 ESE	1.56
ME-WS-34	Perry 3.8 NNW	1.12

***Additional CoCoRaHS reports were not complete with 30 days of record**

Drought Monitor September 3, 2024

U.S. Drought Monitor

Maine



September 3, 2024

(Released Thursday, Sep. 5, 2024)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	99.79	0.21	0.00	0.00	0.00	0.00
Last Week 08-27-2024	99.79	0.21	0.00	0.00	0.00	0.00
3 Months Ago 06-04-2024	73.59	26.41	1.76	0.00	0.00	0.00
Start of Calendar Year 01-02-2024	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 09-26-2023	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 09-05-2023	100.00	0.00	0.00	0.00	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:

Lindsay Johnson

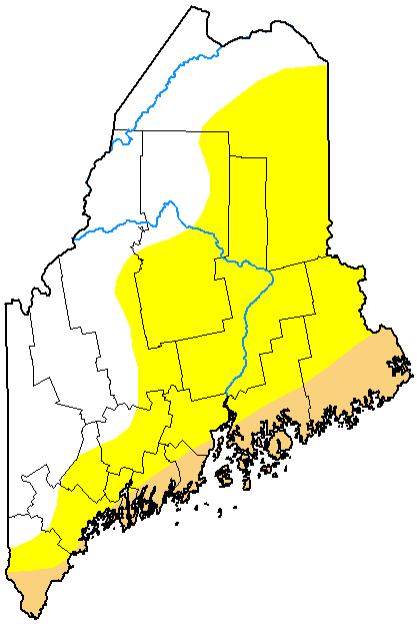
National Drought Mitigation Center

droughtmonitor.unl.edu

Drought Monitor September 24, 2024

U.S. Drought Monitor

Maine



September 24, 2024

(Released Thursday, Sep. 26, 2024)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	39.15	60.85	10.36	0.00	0.00	0.00
Last Week 09-17-2024	75.14	24.86	0.00	0.00	0.00	0.00
3 Months Ago 06-25-2024	82.69	17.31	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2024	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 09-26-2023	100.00	0.00	0.00	0.00	0.00	0.00
One Year Ago 09-26-2023	100.00	0.00	0.00	0.00	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

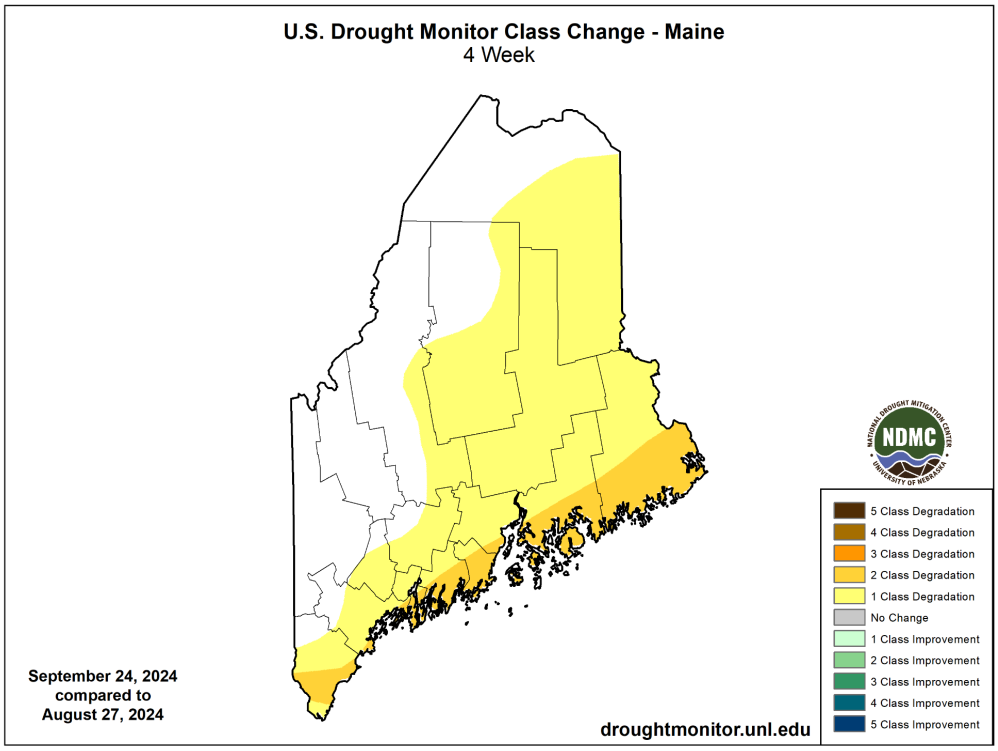
Author:

Brad Rippey

U.S. Department of Agriculture

droughtmonitor.unl.edu

Drought Monitor Change in September 2024



Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
9/3/2024	99.79	0.21	0.00	0.00	0.00	0.00	0
9/24/2024	39.15	60.85	10.36	0.00	0.00	0.00	71
Change	-60.64	60.64	10.36	0.00	0.00	0.00	71

September 1-30, 2024 30 Day Standardized Precipitation Index (SPI) Blend

The Standardized Precipitation Index (SPI) is a widely used index to characterize meteorological drought on a range of timescales. On short timescales, the SPI is closely related to soil moisture, while at longer timescales, the SPI can be related to groundwater and reservoir storage. The SPI Blend is a modified version of the Standardized Precipitation Index (SPI) that uses precipitation data from multiple time scales to assess drought.It was created for use in a high-resolution drought monitoring tool.