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 **January** YEAR **2023**
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 **February 14, 2023**

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.

January 2023

January 2023 was much warmer than average compared to the 1991-2020 climate normals. It featured long stretches of above to well above average temperatures and only brief periods of below average temperatures. This was a result of the monthly average of the North Atlantic Oscillation (NAO) pattern monthly mean of +1.25 standard deviation, while the Pacific North American (PNA) pattern at +0.21 standard deviation. This typically results in higher 500mb heights over the Northeastern United States and typically a progressive jet stream flow from west to east with brief deeper troughing over the east. This is depicted below in the reanalysis of the monthly anomaly of the 500mb Geopotential Heights and the mean heights. We saw anomalous higher heights for the month over the area with nearly no blocking in the North Atlantic resulting in generally high pressure over the North-Central Atlantic west of Spain.

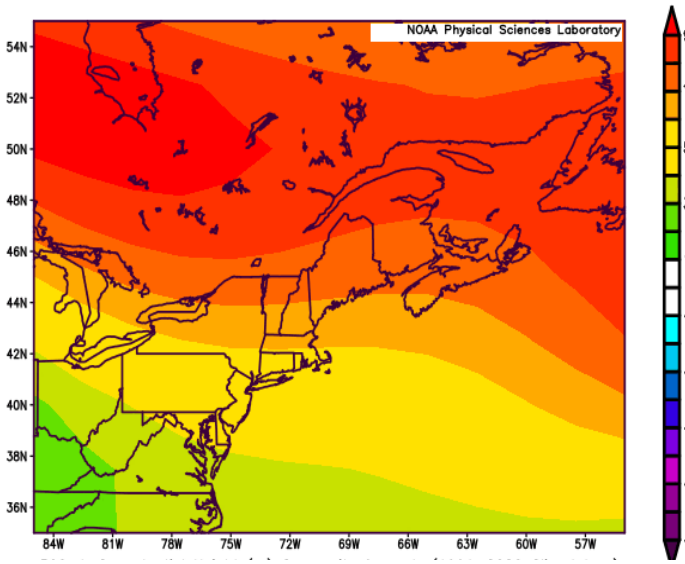


Figure 1: 500mb Geopotential Height (m) Anomalies *(1991-2020 Climo)* January 2023

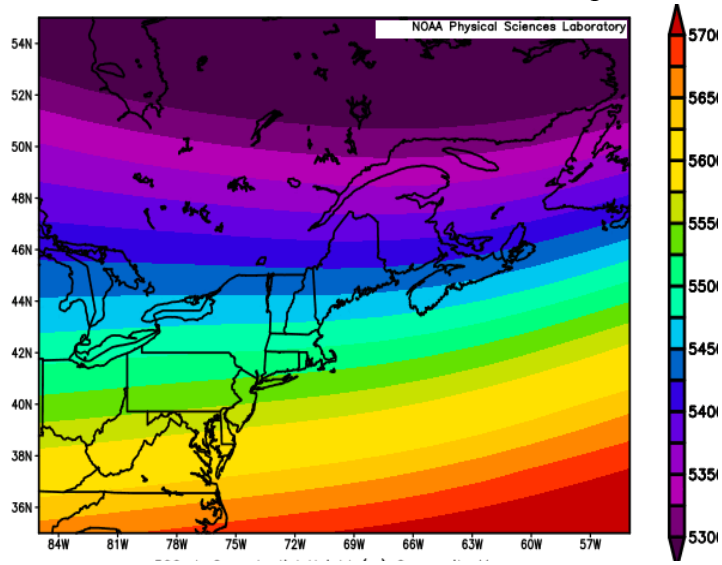


Figure 2: 500mb Geopotential Height (m) Composite Mean January 2023

Source: NOAA Physical Sciences Laboratory

Temperatures across the area ranged from 6.5 to 9.5 degrees above the 1991-2020 climate normals. The month only had 6 days below average temperatures at Caribou and only 4 days below average temperatures at Bangor. It ranked as the 4th warmest January on record at Caribou, and the 2nd warmest at Houlton, Millinocket and Bangor. Bangor only had one night the entire month with a low temperature below zero and the lowest low temperature for the month was 2 below zero. On average, Bangor observes 8 nights with a low temperature below zero in January. At Caribou, there were only 4 nights with a low below zero; and typically there is an average of 15 nights with sub-zero lows.

Town/City	*Avg Monthly Temperature (°F)*	*Normal Monthly Temperature (°F)*	*Departure from Normal (°F)*
Frenchville	18.0	11.3	+6.7
Fort Kent	NA	NA	NA
Caribou	19.0	11.7	+7.3
Houlton	21.8	12.9	+8.9
Millinocket	23.7	15.5	+8.2
Greenville*	22.9	14.2	+8.7
Bangor	27.4	18.5	+8.9
Robbinston*	28.2	19.9	+8.3
Topsfield*	25.0	15.6	+9.4

**Topsfield Records date back to 2000, *Robbinston Records date back to 1994*
**Greenville data gap between 1975 and 1999*

Precipitation for the month ranged from 150 to 200 percent of average across Eastern and Northern Maine. A total of 5.33 inches of rain and melted snow & sleet was observed at Caribou which was the 3rd highest total on record for the month of January. A total of 5.82 inches of rain and melted snow & sleet was observed at Bangor which is the 4th highest total on record. **Snowfall** was generally above normal across the area for the month of January ranging from 7 to 14 inches above normal except only 4-7 inches above normal in far southwestern Piscataquis County and extreme western Penobscot County around Dexter. A total of 38 inches of snow and sleet was observed at Caribou, which ranked as the 8th greatest total for January on record. At Bangor, a total of 29.3 inches of snow and sleet was observed, which tied with 1960 for the 14th greatest January total on record. **Snow depth** increased significantly during the month with several winter storms. The most significant storm across the north was on the 12th into the 13th where some locations in the St. John Valley picked up over 20 inches of snow. Another storm on the 26th produced over a foot of snow in many areas north of Caribou. The most significant snowfall in Bangor and across the Downeast region occurred on the 22nd into the 23rd and locally produced totals in excess of a foot. A storm on the 16th produced significant sleet across the region with amounts generally ranging from 2 to 4 inches. Several other small snowfalls were observed during the month. By the end of the month the snow depth ranged from 2 to 3 feet across northern areas with locally around 4 feet across the highest terrain, and from 6 to 12 inches along the coast including up to the Bangor area. See the table below for more details on exact totals…

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*	*Monthly Average Snow Depth*
Frenchville	2.59	1.51	+1.08	171.5%					
Fort Kent	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caribou	5.33	2.95	+2.38	180.7%	38.0	25.0	+13.0	26	12.2
Houlton	3.67	2.65	+1.02	138.5%					
Millinocket*	4.40	2.70	+1.70	163%	31.5			17	7.6
Greenville*	5.96	2.98	+2.98	200%					
Bangor	5.82	3.17	+2.65	183.6%	29.3	18.6	+10.7	19	4.6
Robbinston*	9.28	4.85	+4.43	191.3%	24.8	24.8	0.0	12	4.9
Topsfield*	7.30	4.13	+3.17	176.7%	40.7	23.6	+17.1	22	7.7

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

Streamflows coming out of the month of December 2022 much of the river flows were Much Above Normal (greater than 90th percentile) but ice was impacting several USGS gages across the north. Across Central and Downeast areas several rivers were not impacted with ice in the beginning of January and ranged from Much Above Normal to Record Daily Flows (95th to 100th percentile). By the end of the month river flows were slowly falling across the area and becoming more ice impacted. Flows fell to Above Normal (76th-90th percentile) across the area with some gages that were open falling back to Normal flows.

Ice: The morning of January 1st the ice jam on the Penobscot between the Howland dam upstream finally alleviated the backed up river water levels. We were able to see Gardner Lane and Merrill Brook Lane in Howland to be reopened and residents returned to their homes. At the same time across the Aroostook River from Fort Fairfield upstream 5-6 river miles another ice jam was causing water to back up and by late January 2nd we were alerted to flooding of Grimes Road due to backwater issues. By January 3rd ice above the Caribou dam back approximately 1-2 miles dislodged over the dam and went downstream and got stuck behind the ongoing ice jam. This resulted in significant hummock ice and an ice jam stretching from the Maine & New Brunswick border above Tinker Dam back approximately 9 to 12 river miles growing to nearly 14 river miles by late on the 3rd. This was causing continued backwater issues flooding Grimes Road and several of the low lying fields along the Fort Fairfield Road between Caribou and Fort Fairfield. Water levels finally fell enough to end flooding by January 4th. Ice continued to build across northern rivers and thickened. On the St. John River wildlife (deer & moose) began using the ice for walking routes given the deep snowpack by mid to late month. On the Aroostook River wildlife activity was noted by mid to late month as well but more frequently noted by late month. Late in the month snowmobile activity was using the Aroostook River in Oxbow indicating ice thickness greater than 8 inches. USGS river ice measurements by late month indicated ice thickness of 6-12 inches on waterways in the Aroostook River basin with 10-14 inches across the St. John basin. Several of the

rivers had flow measurements taken late month which still indicates above normal flows especially on the St. John River. Across the southern & central basins we saw poor ice development in the beginning of the month due to above normal temperatures. Initially all the southern and central basins including the Penobscot & Piscataquis had shore, anchor and frazil ice. By late month we saw significant ice development in areas that had relatively flat flow with no dam or tributary activity. At the USGS gage measurement locations many of those rivers were only 50 percent ice covered with black ice present, however nearby each gage featured 100 percent river cover. In addition, USGS webcam at Bangor showed significant ice development during the first ten days of January on the Penobscot & Kenduskeag. By mid month we had a nearly frozen Penobscot in Bangor and Kenduskeag through the downtown area. By late month significant openings developed in the Penobscot due to warmer temperatures and rainfall with ice still on the Kenduskeag.

Pic 1: Penobscot River, Bangor, ME on Jan 24th *(Courtesy: USGS)*


Pic 2: St. John River, Fort Kent, ME on Jan 16th

Pic 3: St. John River, Allagash, ME on Jan 16th

Pic 4: Allagash River, Allagash, ME on Jan 16th

Pic 5: Aroostook River Hummock Ice 1-3 ft thick, Fort Fairfield, ME on Jan 17th

Pic 6: Aroostook River Flooding, Fort Fairfield, ME on Jan 3rd *(Courtesy: Fort Fairfield PD)*

Pic 7: St. John River w/ 10” Ice Thickness, Allagash, ME on Jan 30th

Pic 8: Aroostook River Snowmobile Trail over Ice, Oxbow, ME on Jan 31st

Groundwater: Frozen surface down to approx 5 inches across the area. It is noted that at the National Weather Service Office in Caribou the frost depth went from 5 inches to 4 inches by late month likely due to significant snowpack insulating the ground. The significant rainfall from the fall into early winter allowed for the grounds to be soaked and it is noted in the groundwater well data. Across the Central Highlands, Bangor area and far Downeast we continued to see Above Normal groundwater levels in the 75-90th percentile. Hancock County along with the North Woods into Northeastern Aroostook county saw improvements and continued soaked grounds that resulted in 90-97th percentile levels which is Much Above Normal. Of that the observation sites at Hadley Lakes and Fort Kent reporting >95th percentile close to monthly records.

In regards to **Drought** monitoring, the entire month of January featured No Drought conditions.

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

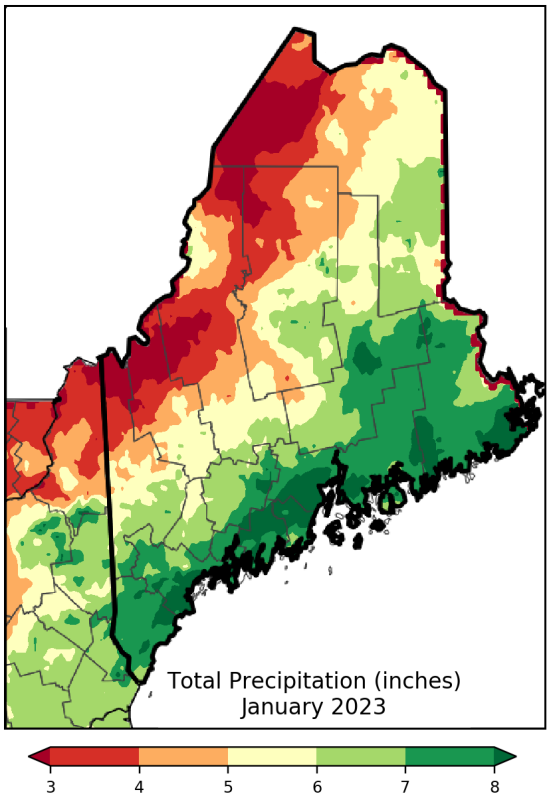


Figure 3: Monthly Precipitation Totals for January 2023

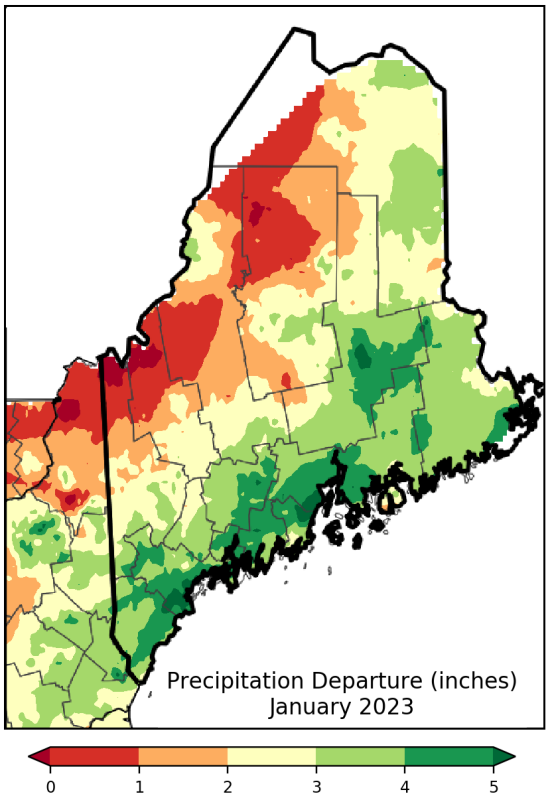


Figure 4: Monthly Precipitation Departures from Normal for January

Source: Northeast Regional Climate Center

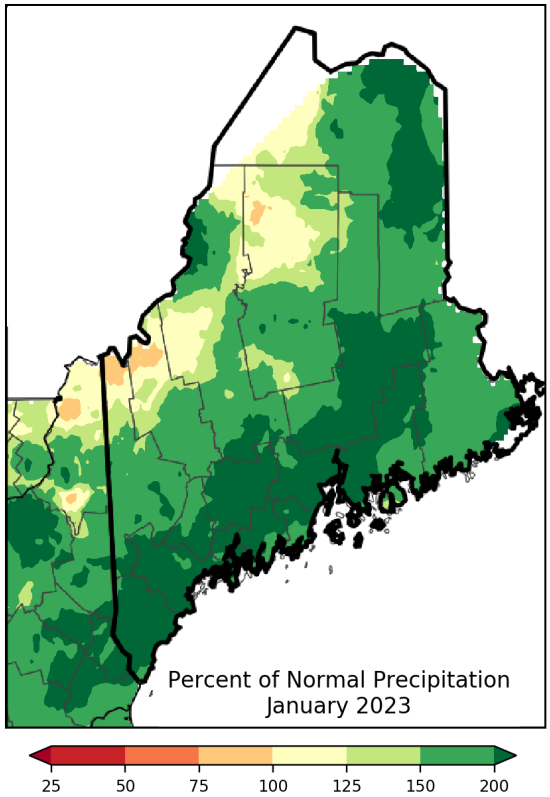


Figure 5: Percent of Normal Precipitation January 2023

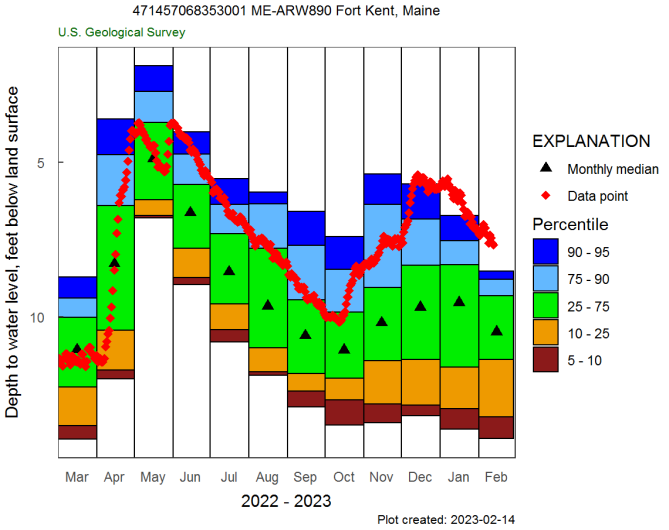
Source: Northeast Regional Climate Center

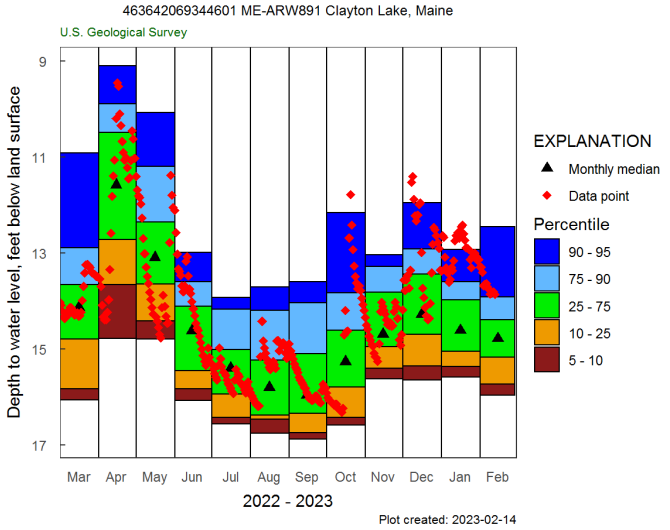
January Streamflows for Rivers

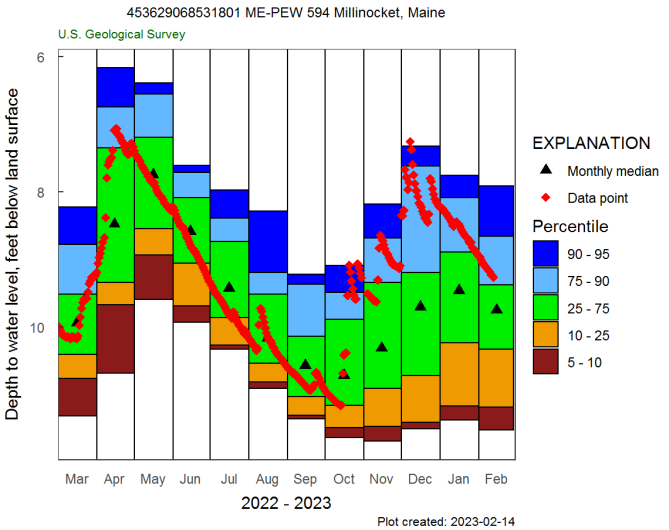
River	Monthly Mean Flow (cfs)	% Normal (mean)	Percentile Class	Drainage (mi^2)	Years of Record
Big Black River near Depot Mtn	NA	NA	**Ice Affected**	171	38
St. John River at Nine Mile Bridge	NA	N/A	**Ice Affected**	1341	71
Allagash River near Allagash	NA	NA	**Ice Affected**	1478	90
St. John River at Dickey	NA	NA	**Ice Affected**	2680	75
St. John River at Fort Kent	7950	179.45%	Much Above Normal	5929	95
Fish River near Fort Kent	NA	NA	**Ice Affected**	873	92
Aroostook River near Masardis	NA	NA	**Ice Affected**	892	64
Aroostook River at Washburn	NA	NA	**Ice Affected**	1654	91
St. Croix River at Vanceboro	706.56	90.99%	Normal	413	94
St. Croix River at Baring	2333.45	94.57%	Normal	1374	63
Grand Lake Stream at Grand Lake Stream	533.02	140.44%	Above Normal	228.3	94
Narraguagus River at Cherryfield	1023.19	193.60%	Much Above Normal	227	73
East Branch Penobscot River at Grindstone	4128.57	NA	**Ice Affected**	837	100
Mattawamkeag near Mattawamkeag	2911.29	183.28%	Much Above Normal	1418	87
Piscataquis River near Dover-Foxcroft	661.32	198.43%	Much Above Normal	298	119
Sebec River at Sebec	1043.13	241.88%	Much Above Normal	326	67
Piscataquis River at Medford	4184.29	NA	**Ice Affected**	1162	90
Penobscot River at West Enfield	20742.86	NA	**Ice Affected**	6422	119

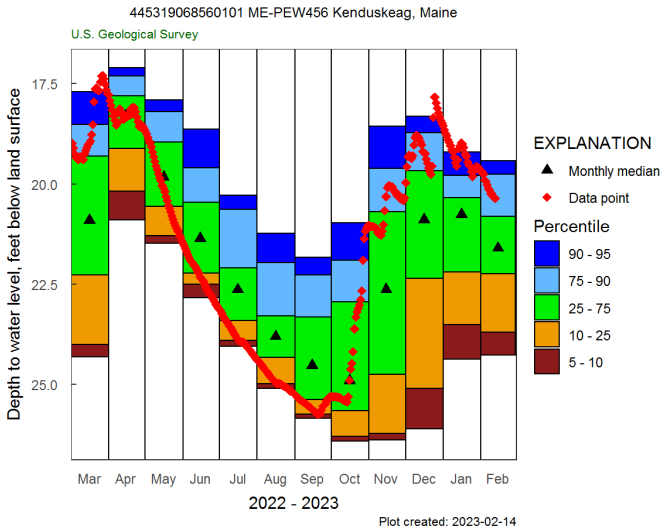
January Average Groundwater Levels

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









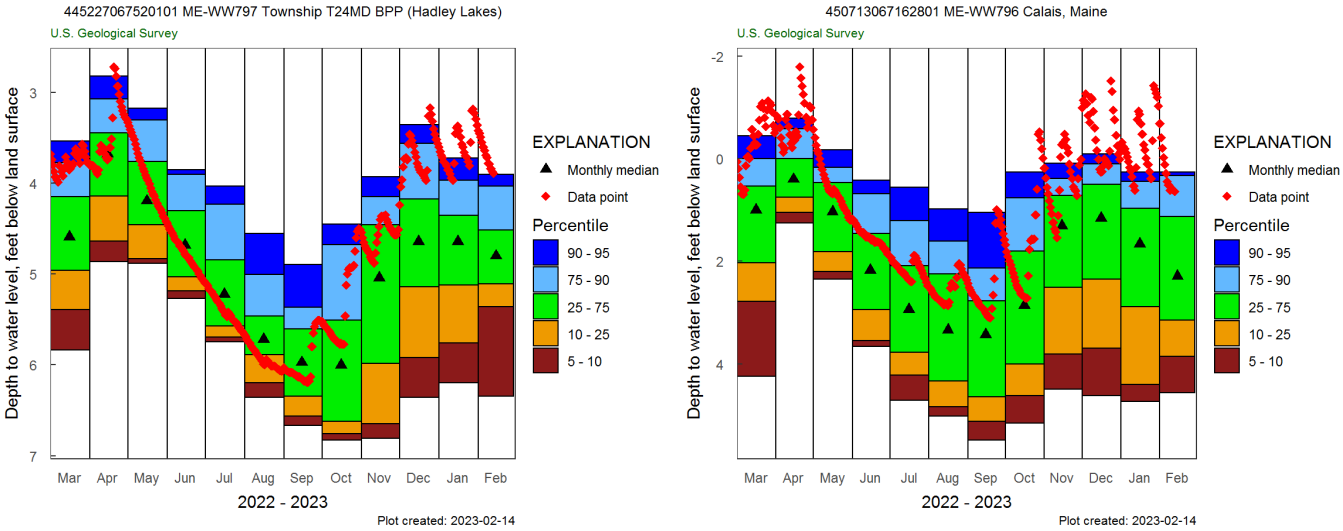


Figure 6-11: Groundwater Level Yearly Plots to Current
Source: United States Geological Survey

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.

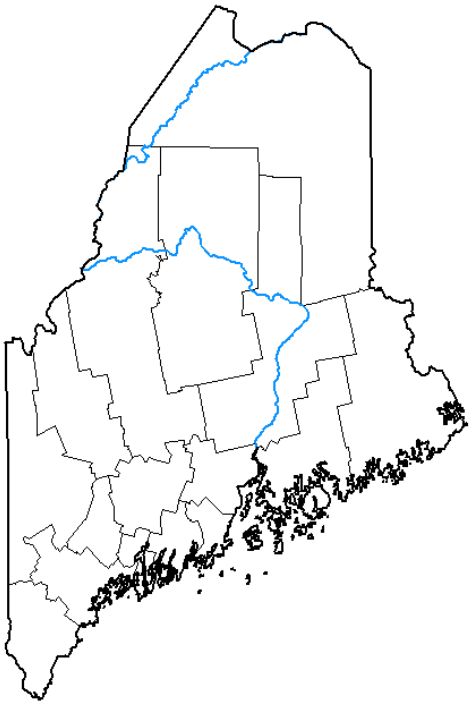
Non-Routine Hydrologic Products
January 2023
WFO Caribou, ME

Product	How Many Issued	Reason for Issuance
Flood Advisory	1	Ice Jam
Flood Advisory	2	Excessive Rainfall + Snowmelt
Flood Watch	1	Heavy Rain + Snowmelt

Drought Conditions for January 2022

U.S. Drought Monitor

Maine



January 3, 2023

(Released Thursday, Jan. 5, 2023)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week *12-27-2022*	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago *10-04-2022*	88.86	11.14	3.23	0.00	0.00	0.00
Start of Calendar Year *01-03-2023*	100.00	0.00	0.00	0.00	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 *01-04-2022*	72.42	27.58	11.82	5.32	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:
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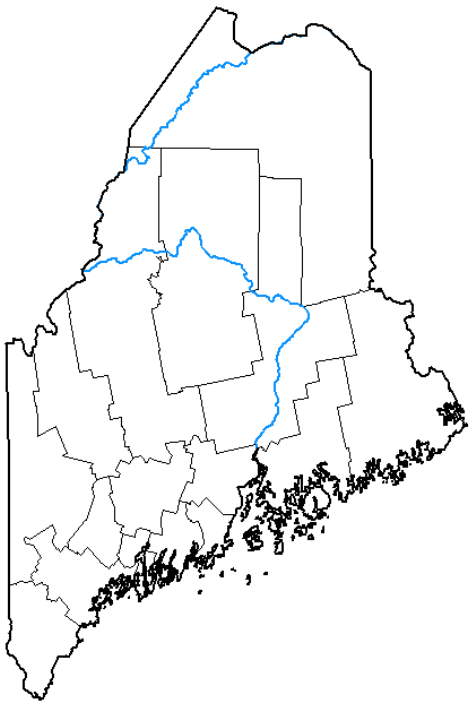
CPC/NOAA

droughtmonitor.unl.edu

U.S. Drought Monitor

Maine



January 31, 2023

(Released Thursday, Feb. 2, 2023)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week *01-24-2023*	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago *11-01-2022*	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year *01-03-2023*	100.00	0.00	0.00	0.00	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 *02-01-2022*	59.66	40.34	11.82	5.32	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:

Rocky Bilotta

NCEI/NOAA

droughtmonitor.unl.edu

Drought Classification (Cumulative Percent Area %)

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
1/3/2023	100.00	0.00	0.00	0.00	0.00	0.00	0
1/31/2023	100.00	0.00	0.00	0.00	0.00	0.00	0
Change	0.00	0.00	0.00	0.00	0.00	0.00	0

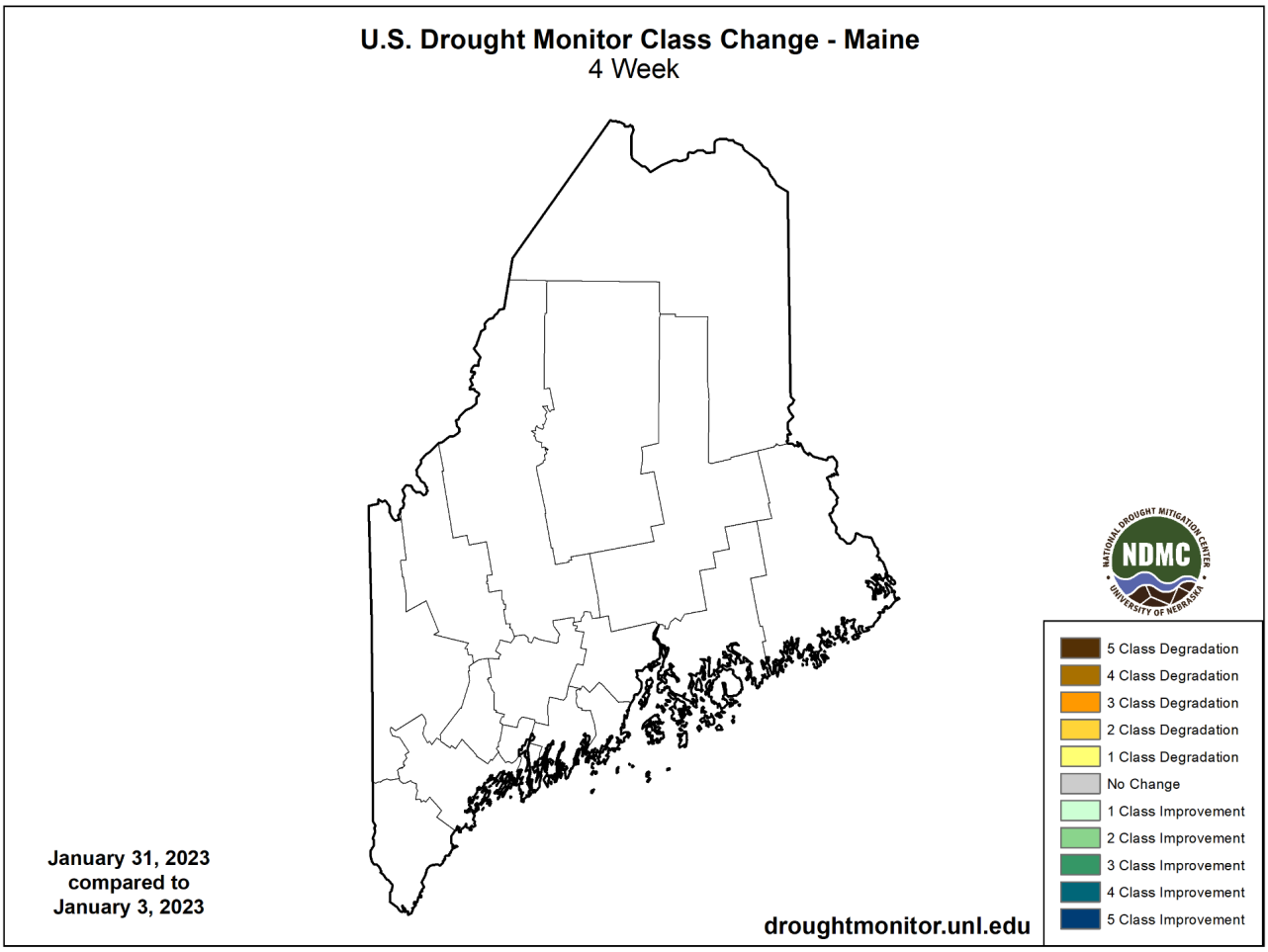


Figure 12-14: U.S. Drought Monitor Drought Classification & Statistics for November
Source: U.S. Drought Monitor