NWS Form E-5 (04-2006) NATIONAL OCEAN (PRES. BY NWS Instruction 10-924)		U.S. DEPARTMENT OF COMME	RCE HYDROLOGIC SER	HYDROLOGIC SERVICE AREA (HSA) Burlington VT	
		NIC AND ATMOSPHERIC ADMINISTRAT NATIONAL WEATHER SERV	/ICE Bur		
MONTHLY REPORT OF HYDRO		ROLOGIC CONDITIONS	REPORT FOR: MONTH	YEAR	
			December	2023	
TO:	Hydrologic Information	ologic Information Center, W/OS31 A's National Weather Service	SIGNATURE /s/ John Goff, Se	nior Service Hydrologist	
	1325 East West Highway Silver Spring, MD 20910-3283	way 910-3283	DATE Janu	ary16, 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.

Overview

December 2023 was an active month from a hydrological perspective across the NWS Burlington HSA. A robust and progressive storm track across the region allowed numerous weather systems to affect the area, most notably on the 3rd and 4th, 10th and 11th, 17th and 18th, and from the 27th to 29th. Conditions as a whole were very mild and wet, with several sites reporting near record warmth and precipitation for the month. In fact, mean temperatures for the 31-day period generally averaged an impressive 6 to 9 degrees above the long term climatological mean for the entire area, while precipitation averaged between 1.5 and 4 inches above normal with some variation noted (Table 1, Figs. 1 and 2). With the unseasonable warmth, it was not surprising to see lower than average snowfall totals in most areas, especially in the broader valleys which observed significant negative anomalies from the long term 30-year mean. Of the snow that did fall, a high percentage occurred during two elevation-dependent snowstorms, the first occurring on December 3-4, and the second on the 10th and 11th. By December 15, at least the start of a building mountain snowpack was well underway (Fig. 4). That was all to change by the 17th and 18th as a powerful winter storm affected the region with heavy rainfall and severe flooding. More on that below.

Notable Hydrology

Capping an end to extremely active weather year, a powerful storm system tracked through the region on December 17-18, 2023. Very mild temperatures and heavy rainfall accompanied this system, leading to a complete loss of the extant early season snowpack across the mountains (Figs. 5 and 6). This melt, combined with the heavy rain and excessive runoff led to widespread flooding across the area. Most notable was the extensive flooding of rivers, several of which exceeded major flood stage creating significant impacts to affected towns. These included, but were not limited to Johnson, VT, Jeffersonville, VT, Waterbury, VT and Ausable Forks, NY (Figs. 7, 8 and 9). 41 discrete Flood Warnings were issued by NWS Burlington during the period, with 21 of those being River Flood Warnings (Table 2). A preliminary assessment indicated a lead time of 1 hour, 6 minutes with a POD of 0.89 for applicable River Flood Warnings (Table 3).

December 2023 Temperature Avg. (°F), Precipitation (in.) and Historical Rank

Site	Average Temp	Rank	Total Precipitation	Rank
Burlington, VT	35.2	2	5.78	2
Montpelier, VT	30.2	3	М	м
St. Johnsbury, VT	M	М	5.30	2
Springfield, VT	34.7	2	5.28	1
Plattsburgh, NY	32.4	3	4.53	4
Saranac Lake, NY	29.1	2	4.33	14
Massena, NY	30.9	3	2.89	23

 Table 1: December 2023 precipitation and average temperature data for the NWS Burlington, HSA. Most long-term climate

 sites in the area saw values among the ten highest in the historical record for both categories.



Figure 1: December 2023 monthly temperature departures from normal (°F) across the NWS Burlington HSA. On average, significant positive departures from +6 to +9 degrees were observed.



Figure 2: Monthly precipitation departures from normal (in.) for the NWS Burlington, VT HSA. In general, positive monthly departures of 1.5 to 4 inches were observed across the area with some variation.



Figure 3: Snowfall departures from normal for December 2023 across the NWS Burlington, VT HSA. Most areas observed significant negative values given the near record warmth across the region during the month.



Figure 4: Snow depth across the NWS Burlington HSA at 700 AM LST, December 15, 2023. Note consistent depths of 4 to 8 inches had been established across the Green and Adirondack Mountains with locally higher/lower amounts depending on elevation.



Figure 5: Storm total rainfall from December 17-18, 2023 across the NWS Burlington, VT HSA. 48-hour totals in general ranged from 1.5 to 3.5 inches across the area with some variability.



Figure 6: Modeled snow water equivalent (SWE) from December 17 to 19, 2023 for the NWS Burlington, VT HSA. Note the near full loss of SWE across much of the mid terrain and lower elevations. This loss, combined with heavy rainfall (see Fig. 5) during this period led to significant, and in some cases severe river flooding in portions of the HSA.



Figure 7: Hydrograph plots of A) Lamoille River at Johnson, VT, B) Winooski River at Essex Junction, VT, and C) East Branch of the Ausable River at Ausable Forks, NY, and D) Lamoille River at Jeffersonville, VT. All four river gauge sites reached major flooding levels during the December 17-18, 2023 event,



Figure 8: The Town of Waitsfield, VT is affected by significant flooding from the Mad River on the morning of December 18, 2023.



Figure 9: Flooding affects Au Sable Forks, NY on the morning of December 18, 2023. Photo courtesy Rob Fountain, P-R photo.

HYDRO WARNINGS ISSUED BY NWS BURLINGTON FOR DECEMBER 17-18, 2023				
WARNING TYPE	ISSUANCE TIME	AREA		
River 0018	Dec. 18 @ 1254 UTC	E. Br. Ausable R. @ Ausable Forks, NY		
Areal 0052	Dec. 18 @ 1312 UTC	Orange/Rutland/Windsor Cos.		
River 0019	Dec. 18 @ 1321 UTC	Mad R. @ Moretown, VT		
Areal 0053	Dec. 18 @ 1332 UTC	Clinton/Essex/Franklin/Addison Cos.		
Areal 0054	Dec. 18 @ 1403 UTC	Caledonia/Washington Cos.		
Areal 0055	Dec. 18 @ 1431 UTC	Addison/Orange/Washington Cos.		
River 0020	Dec. 18 @ 1451 UTC	Winooski R. @ Essex Jct., VT		
Areal 0056	Dec. 18 @ 1530 UTC	Clinton/Essex Cos.		
Areal 0057	Dec. 18 @ 1550 UTC	Addison/Chittenden/Lamoille/Washington Cos.		
River 0019 Upgrade	Dec. 18 @ 1601 UTC	Mad R. @ Moretown, VT		
River 0021	Dec. 18 @ 1610 UTC	Lamoille R. @ Johnson, VT		
River 0022	Dec. 18 @ 1658 UTC	Lamoille R. @ Jeffersonville, VT		
River 0020 Upgrade	Dec. 18 @ 1714 UTC	Winooski R. @ Waterbury, VT		
Areal 0058	Dec. 18 @ 1732 UTC	Caledonia/Essex/Orleans Cos.		
Areal 0052 Extension	Dec. 18 @ 1745 UTC	Orange/Rutland/Windsor Cos.		
River 0018 Upgrade	Dec. 18 @ 1847 UTC	E. Br. Ausable R. @ Ausable Forks, NY		
Areal 0053 Extension	Dec. 18 @ 1901 UTC	Clinton/Essex/Franklin/Addison Cos.		
River 0019 Upgrade	Dec. 18 @ 1923 UTC	Mad R. @ Moretown, VT		
River 0023	Dec. 18 @ 1932 UTC	Winooski R. @ Montpelier, VT		
River 0024	Dec. 18 @ 1945 UTC	Winooski R. @ Essex Jct., VT		
River 0025	Dec. 18 @ 1948 UTC	Otter Cr. @ Center Rutland, VT		
River 0026	Dec. 18 @ 1953 UTC	Missisquoi R. @ North Troy, VT		
River 0027	Dec. 18 @ 1957 UTC	Wells R. @ Wells River, VT		
Areal 0055 Extension	Dec. 18 @ 2020 UTC	Orange/Washington Cos.		
Areal 0052 Extension	Dec. 18 @ 2035 UTC	Orange/Rutland/Windsor Cos.		
Areal 0059	Dec. 18 @ 2046 UTC	Addison/Chittenden/Franklin/Lamoille Cos.		
Areal 0057 Extension	Dec. 18 @ 2134 UTC	Addison/Chittenden/Lamoille/Washington Cos.		
Areal 0060	Dec. 18 @ 2154 UTC	Caledonia/Orange/Washington Cos.		
Areal 0055 Extension	Dec. 18 @ 2319 UTC	Orange/Washington Cos.		
Areal 0058 Extension	Dec. 18 @ 2323 UTC	Caledonia/Essex/Orleans Cos.		
Areal 0052 Extension	Dec. 18 @ 2325 UTC	Orange/Rutland/Windsor Cos.		
River 0028	Dec. 19 @ 0006 UTC	Barton R. @ Coventry, VT		
River 0029	Dec. 19 @ 0103 UTC	Missisquoi R. @ East Berkshire, VT		
River 0021 Upgrade	Dec. 19 @ 0211 UTC	Lamoille R. @ Johnson, VT		
Areal 0058 Extension	Dec. 19 @ 0226 UTC	Caledonia/Essex/Orleans Cos.		
River 0030	Dec. 19 @ 0227 UTC	Passumpsic R. @ Passumpsic, VT		
River 0022 Upgrade	Dec. 19 @ 0448 UTC	Lamoille R. @ Jeffersonville, VT		
River 0024 Upgrade	Dec. 19 @ 0727 UTC	Winooski R. @ Essex Jct., VT		
River 0030 Upgrade	Dec. 19 @ 1131 UTC	Passumpsic R. @ Passumpsic, VT		
Areal 0061	Dec. 19 @ 1226 UTC	Clinton Co.		
Areal 0061 Extension	Dec. 19 @ 1517 UTC	Clinton Co.		

Table 2: NWS Burlington issued a total of 41 hydrological warnings during December 17-18, 2023. Of those, 21 were River Flood Warnings and 20 were Areal Flood Warnings.

RIVER FLOOD VERIFICATION STATISTICS FOR DECEMBER 17-18, 2023 FOR NWS				
BURLINGTON, VT				
POD	0.89			
FAR	0.00			
CSI	0.89			
Lead Time for Flood Stage	1 hour, 6 minutes			
Lead Time for Crest	8 hours, 59 minutes			

Table 3: Selected River Flood Warning verification statistics for the December 17-18, 2023 flooding event for NWS Burlington, VT. The office successfully hit on 10 of 11 of applicable warnings, with a Probability of Detection (POD) of 0.89, a False Alarm Rate (FAR) of 0.00 and an average Lead Time of 1 hour, 6 minutes.