

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) Burlington VT
MONTHLY REPORT OF HYDROLOGIC CONDITIONS		REPORT FOR: MONTH YEAR July 2023
TO: Hydrologic Information Center, W/OS31 NOAA's National Weather Service 1325 East West Highway Silver Spring, MD 20910-3283		SIGNATURE /s/ John Goff, Senior Service Hydrologist DATE August 22, 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.

Overview

The month of July 2023 will be long remembered as one of the most impactful weather months in living memory across portions of the NWS Burlington HSA for many residents. During the month, numerous rounds of showers and thunderstorms dropping heavy rainfall and led to areas of significant, and in some cases devastating flash flooding. After a synoptic-scale pattern change in the latter half of June, persistent wet conditions settled across the region as frequent slow moving areas of low pressure dropped copious amounts of rainfall every few days. These systems greatly increased ground moisture levels such that the soil's capacity to absorb repeated rainfall was lessened significantly. By month's end, positive rainfall departures abounded with Montpelier setting its monthly July precipitation record (Table 1). Numerous flood and flash flood events occurred with varying degrees of severity with NWS Burlington issuing 50 discrete Flash Flood Warnings alone during the month. The primary event occurred from July 9 to 11, with several other "satellite" events occurring on either side of that time frame. The most notable events are summarized below, understanding the constraints of this document limits the breadth to which they are described.

Specifics and Notable Hydrology

Ellenburg/Lyon Mountain, NY Flash Flood Event

The first system of significance occurred during the morning and afternoon hours of July 2 when rounds of training thunderstorms affected portions of Clinton County, NY in the towns of Ellenburg and Lyon Mountain. Two bursts of torrential rainfall occurred, the first occurring in the early morning hours after which another round developed in the early afternoon. Believable rainfall estimates between 5 and 8 inches occurred in this area including the New York Mesonet site at Ellenburg which recorded an impressive 5.21 inches (Fig. 1). This led to severe flash flooding with Clinton County Emergency Management reporting over 20 road washouts and several homes damaged. Perhaps the most severe flash flooding occurred in the Blue Haven Campground in Ellenburg, NY where rapid rises on the North Branch of the Great Chazy River led to evacuations of over 200 people during the early morning hours of the 2nd. The fast flowing water reached depths of up to 5 feet in this location leading to severe damage. Several campers were destroyed, but the quick action of the property owners and other campers to alert people resulted in no loss of life with only one injury reported (Figs. 2 and 3). The following day, NWS Burlington, VT performed an onsite flood damage assessment survey of the affected area.

Northern New York and Vermont scattered flash flooding

On July 7, another round of showers and thunderstorms with torrential rainfall affected portions of Vermont and northeastern New York. While not all areas received heavy rainfall, some spots experienced excessive amounts on the order of 3 to 5 inches. This led to additional areas of flash flooding which in some cases was severe. The hardest hit areas were 1) Clinton County, NY in the town of Altona and 2) in the towns of Killington and Bridgewater in southern Vermont (Fig. 4). Scattered to numerous road washouts occurred during the afternoon and evening hours with perhaps the most notable event being a large landslide which blocked U.S. Route 4 in the town of Killington (Fig. 5).

Devastating Vermont flash flooding of July 9-11, 2023

This was the most severe flash flood/flood event in the state since Tropical Storm Irene 12 years prior in August 2011. During this time, repeated rounds of slow moving showers and storms, some with torrential rainfall affected much of the Green Mountain State. Multi-day totals averaged from 3 to 9 inches in this area with daily rainfall records set in several locations (Fig. 6). As a result, severe to catastrophic damage occurred in many locations, most notably in the City of Barre, VT, and in the towns of Weston, Ludlow and Plymouth just to name a few. In these and scattered other areas, the flooding was much worse than in Irene. In others, it wasn't quite as devastating but considerable to severe nonetheless (Figs. 7-9). In addition to flash flooding, severe river flooding also occurred along stretches of the Ottauquechee, Otter Creek, Winooski and Lamoille Rivers. The level on the Winooski River at Montpelier reached its second highest crest on record, eclipsed only by the Great Flood of 1927. This led to devastating flooding in the city with large swaths of the downtown district inundated by as much as 5 feet of water (Figs. 10-11). Record, or near record crests were also observed along the Lamoille R., especially in the Johnson and Cambridge, VT area where significant flood damage occurred (Figs. 12-13). Another unfortunate result of the torrential rainfall totals was numerous slope failures and landslides that occurred across the state during and in the week after this terrible event. Several of these damaged roads and in some cases, damaged or completely destroyed homes. To date, over 50 landslides have been reported to Vermont's Agency of Natural Resources (Fig. 14). The NWS in Burlington, with support from other NWS office and regional support staff, coordinated a multi-day flood damage assessment survey in the days following this event. This work led to proper archival documentation and improved flood forecast services for several communities (Fig. 15).

Scattered flash flooding July 13-24, 2023

Additional flash flooding, while less severe than the prior events described here, continued through the middle and later portions of the month as the persistent wet pattern held strong. In Essex County, New York, the town of Schroon experienced significant road washouts on the 15th when training storms dropped 1 to 3 inches of rain. Road washouts and a landslide occurred in Proctor, VT on 18th. Other towns affected by flash flooding of varying degrees during this time were Paradox in New York, and Barton, Morrisville, Middletown, East Middlebury and Enosburg in Vermont (Fig. 16).

Federal disaster declaration

As a result of these terrible events, President Biden declared a federal disaster for Clinton and Essex Counties in New York, and for most counties in Vermont.

JULY 2023 MONTHLY PRECIPITATION DEPARTURES FOR SELECTED ASOS PLATFORMS IN THE NWS BURLINGTON HSA		
SITE	OBSERVED AMOUNT (IN.)	DEPARTURE FROM NORMAL (IN.)
Burlington, VT (BTV)	5.89	+1.83
Montpelier, VT (MPV)	12.06R	+7.79
Morrisville, VT (MVL)	13.69R	+9.48
St. Johnsbury, VT (1V4)	7.72	+3.29
Springfield, VT (VSF)	8.74	+4.88
Rutland, VT (RUT)	7.42	NA
Plattsburgh, NY (PBG)	6.72	+3.11
Saranac Lake, NY (SLK)	5.04	+0.98
Massena, NY (MSS)	1.89	+2.62

Table 1: Observed precipitation totals for July 2023 for selected NOAA/NWS ASOS and/or FAA AWOS platforms. Significant positive departures were observed with Montpelier, VT and Morrisville, VT which set monthly records.

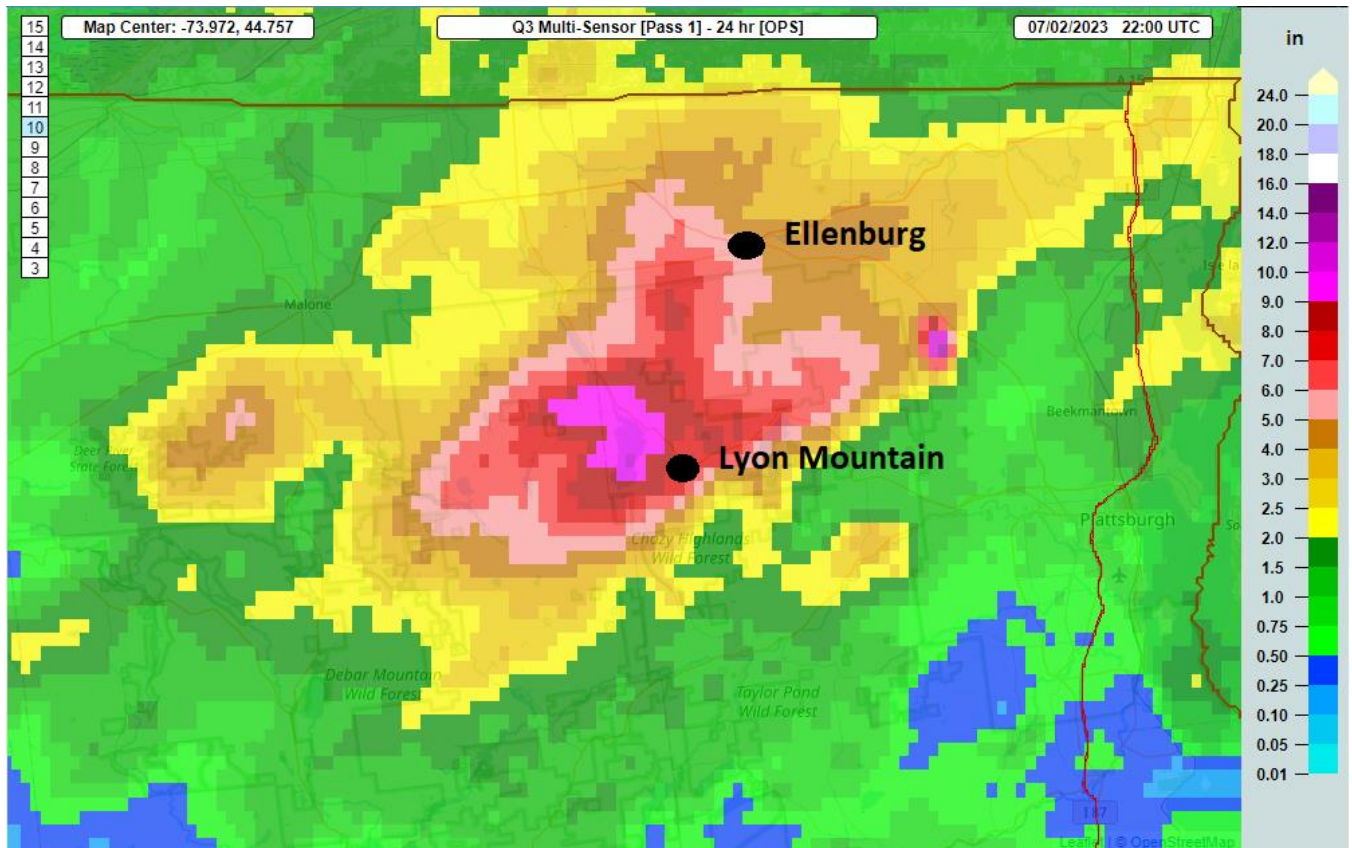


Figure 1: Multi-Radar/Multi-Sensor (MRMS) rainfall estimates in the Ellenburg/Lyon Mountain, NY area on July 2, 2023. Believable rainfall amounts of 5 to 8 inches occurred in this area leading to severe flash flooding.



Figure 2: Flood waters rage through the Blue Haven Campground in Ellenburg, NY on the morning of July 2, 2023. Photo courtesy Clinton Co., NY Emergency Management.



Figure 3: A home is surrounded by flood waters during the morning of July 2, 2023. Photo courtesy Clinton Co., NY Emergency Management.

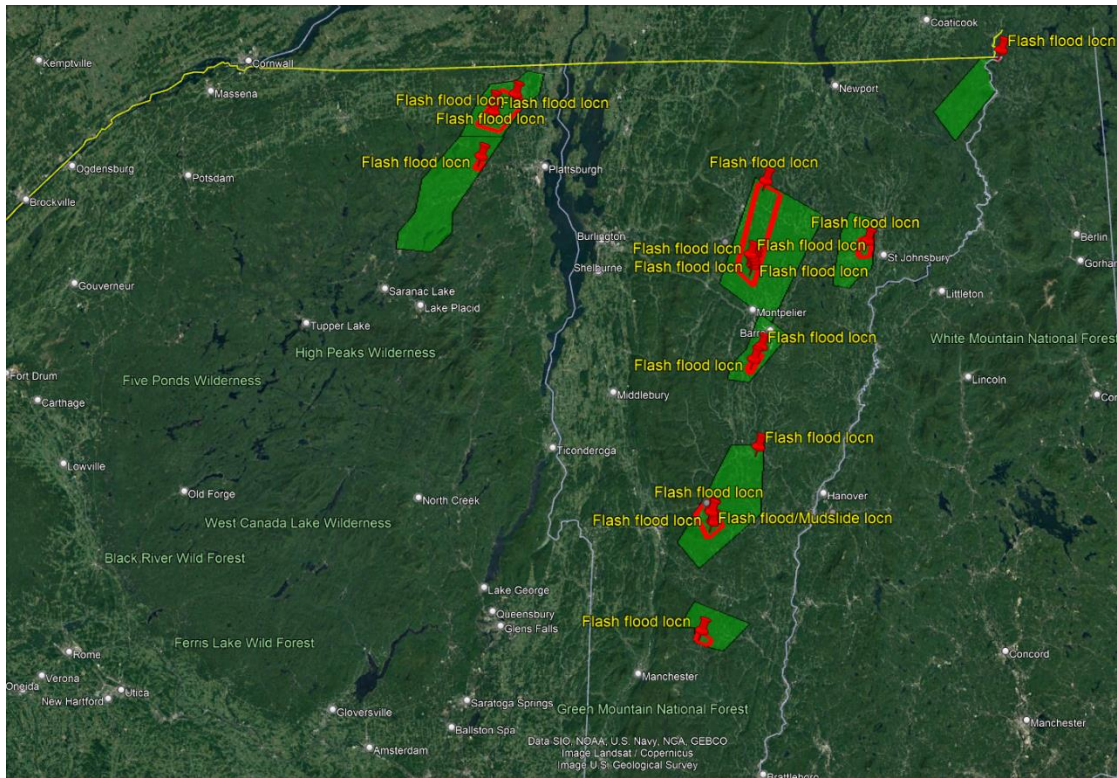


Figure 4: Flash flood locations in Vermont and northeastern New York on July 7, 2023.



Figure 5: A close-up view of a landslide blocking U.S. Route 4 in Killington, VT during the early evening of July 7, 2023. Up to 5 inches of rain fell in this area leading to areas of significant to severe flash flooding. Photo courtesy public.

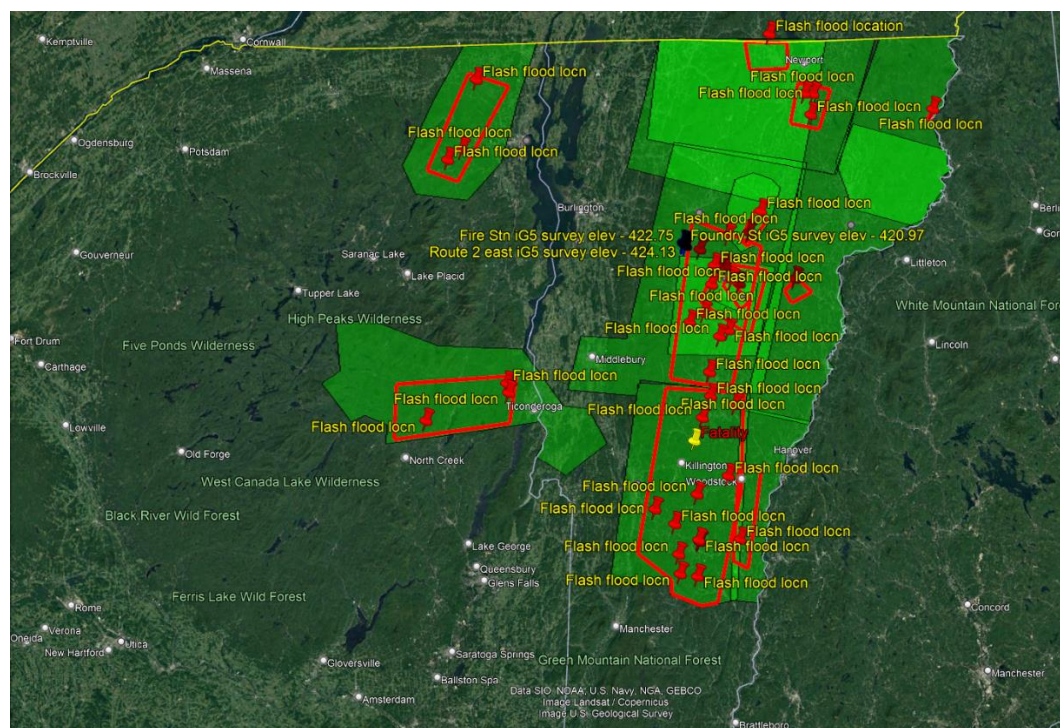
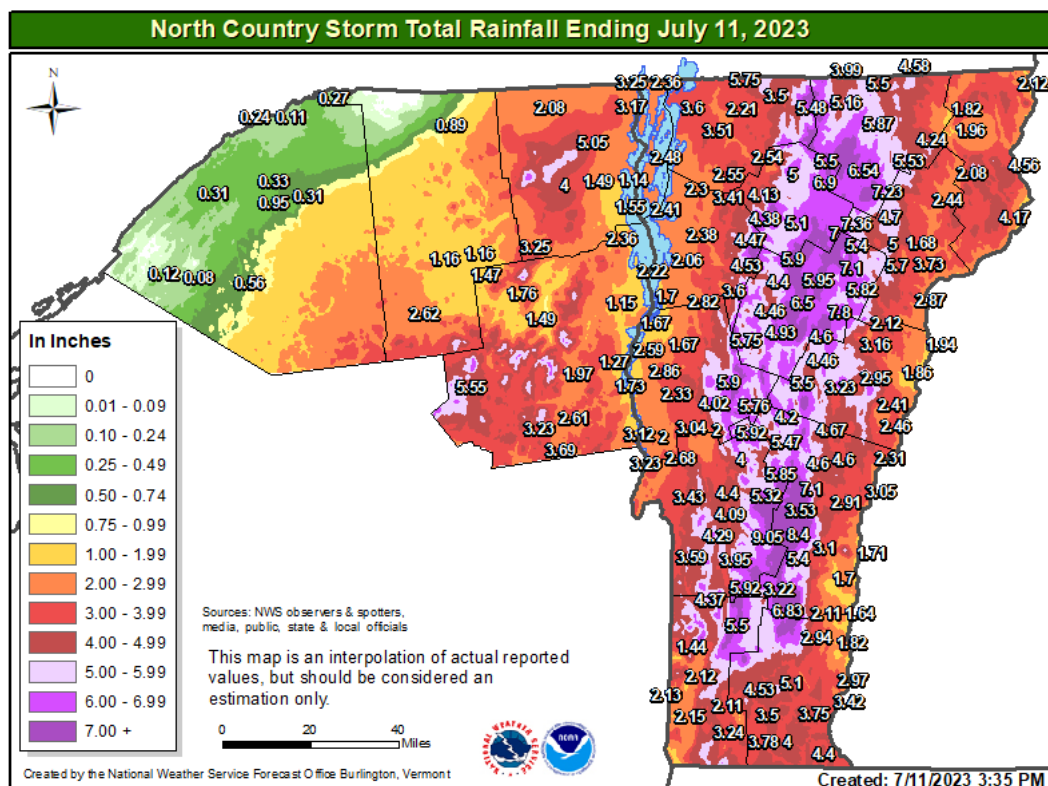




Figure 8: Severe flash flooding seen in Ludlow, VT on the morning of July 10, 2023. Photo courtesy public.



Figure 9: Flash flood waters inundate vehicles and businesses along U.S. Route 302 in Barre, VT on July 10, 2023. Photo courtesy public.



Figure 10: The City of Montpelier is inundated by Winooski R. flood waters on July 11, 2023. The river reached its highest crest in nearly 100 years, severely damaging the central business district of the city. Photo courtesy the U. of Vermont.

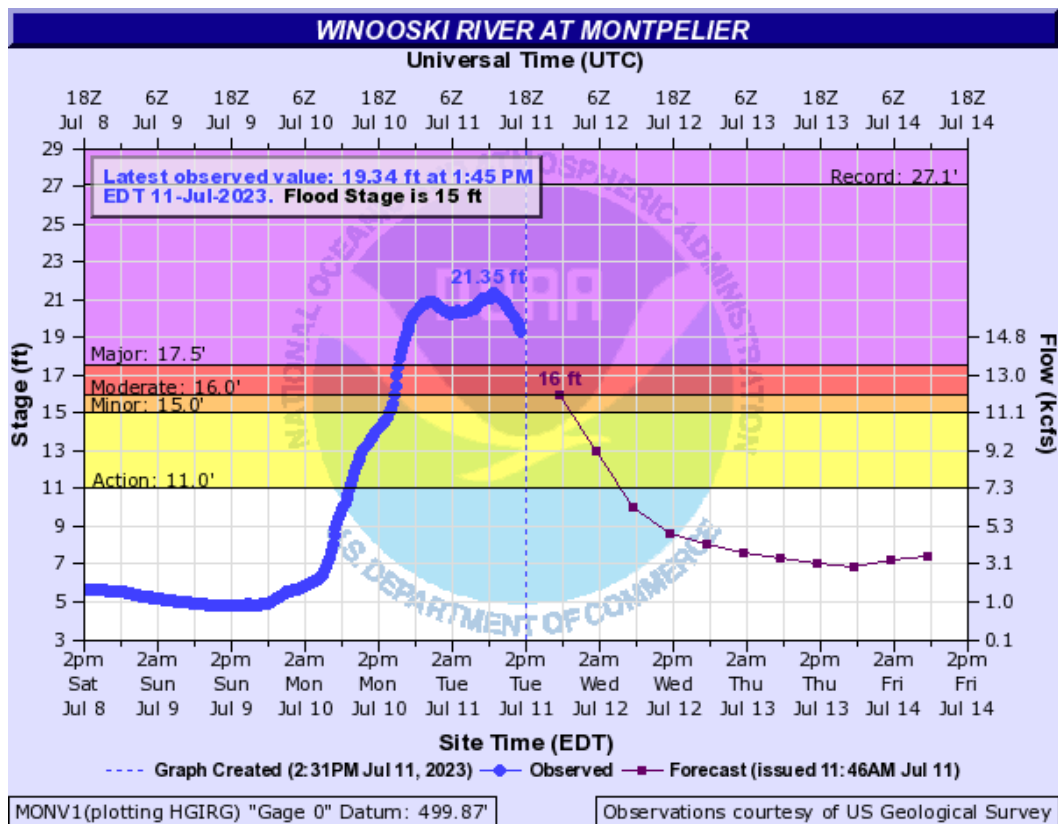


Figure 11: Hydrograph plot from the river gauge on the Winooski R. at Montpelier, VT showing major flood levels on July 10-11, 2023.



Figure 12: Major flooding affects the town of Cambridge, VT on the morning of July 11, 2023. Photo courtesy public.

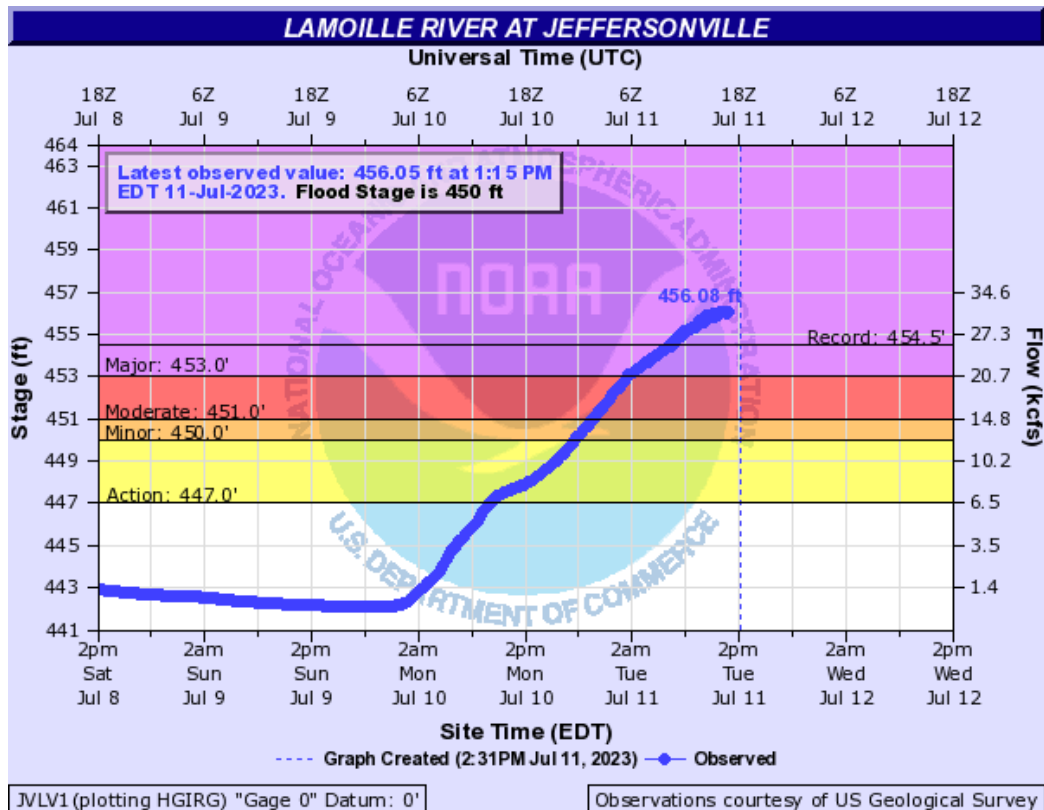


Figure 13: Hydrograph plot from the river gauge on the Lamoille R. at Jeffersonville, VT showing record flood levels on July 11, 2023. Severe flooding affected both Jeffersonville and Cambridge, VT during this time.



Figure 14: A landslide on State Route 62 in Barre, VT on July 10, 2023. Amazingly, the occupants of the two vehicles were uninjured. Photo courtesy public.



Figure 15: John Goff (Senior Service Hydrologist at NWS Burlington) and NWS Pathways student Evan Belkin (NWS Northeast River Forecast Ctr.) survey a high water mark in Weston, VT on July 18, 2023. Photo courtesy Emily Stephan.

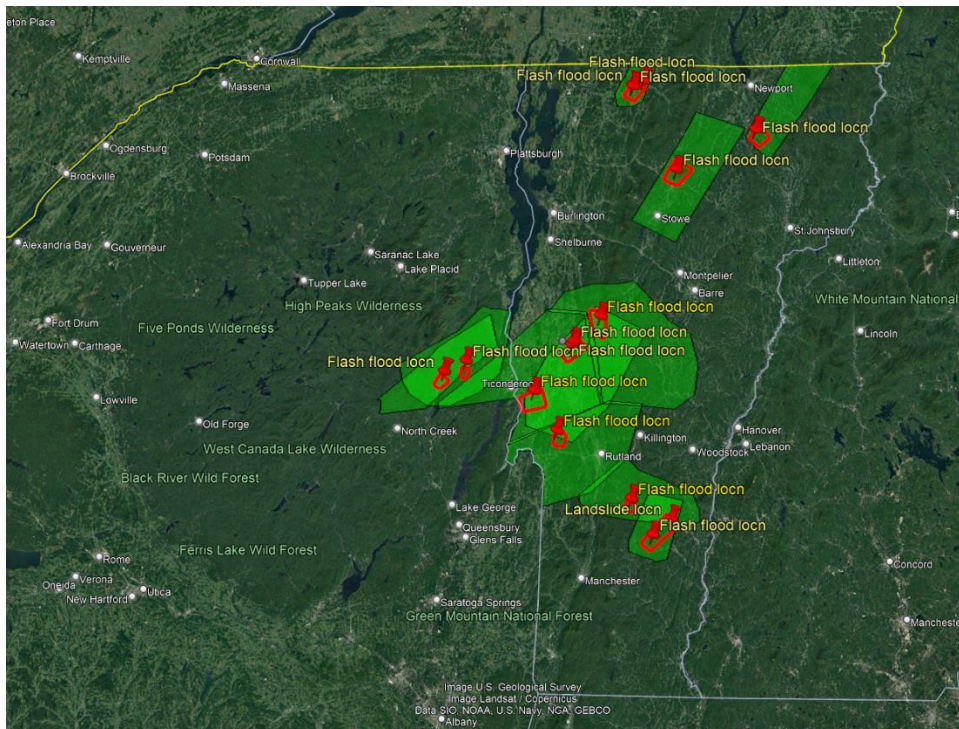


Figure 16: Flash flood locations in Vermont and Essex County, New York from July 13-24, 2023. While generally less severe in nature than the flash flooding events earlier in the month, scattered flooding continued to affect the region with washed out roads and some landslides.