Ice Jam Flooding and NWS Decision Support Services in Northern New York and Vermont During January 2018

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Background

- During January 2018, historic ice jam flooding occurred along the Lamoille and Missisquoi Rivers in northern Vermont, and along the Ausable and Saranac Rivers in northern New York
- Record breaking temperatures in the 50s and 60s, more than 30°F above normal for January, coupled with an antecedent snowpack, 8 to 16 inches above normal, yielded rapid snowmelt
- A storm system brought basin averaged rainfall totals of 0.6 to 2.1 inches onto frozen ground which also contributed to excess runoff and rapid river rises
- This excess flow into the waterways resulted in widespread river ice breakup and the formation of ice jams

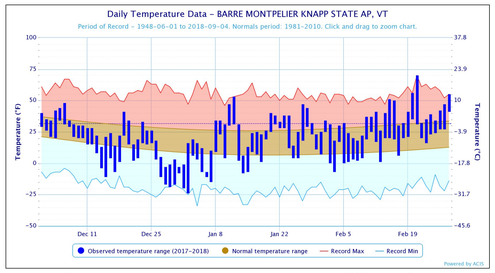


Figure 1: Observed temperature data from Montpelier ASOS from December 1, 2017-February 28, 2018. Note record minimum temperatures at the end of December, and record maximum temperatures on January 12, 2018 which was the day of the ice jam flooding.

Forecast Data

- Thawing Degree Hours (TDH) metric used to forecast melting of snowpack aided in predictability of ice jam potential
  - TDH = T – 32°F
- Forecast accumulated TDH values were more than double the local benchmark (300 TDH) required for river ice breakup, which increased forecaster confidence that ice jams would occur
  - Flood watch was issued with 24 hours of lead time
  - Significant ice jams remained in place for more than a month

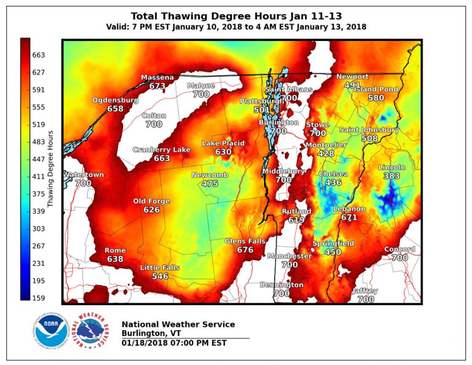


Figure 2: Observed accumulated TDH from 7 pm January 10, 2018 through 4 am January 13, 2018.

- Forecasters utilized local knowledge of ice jam prone locations to advise Emergency Managers of where there was a high likelihood that ice jams would occur

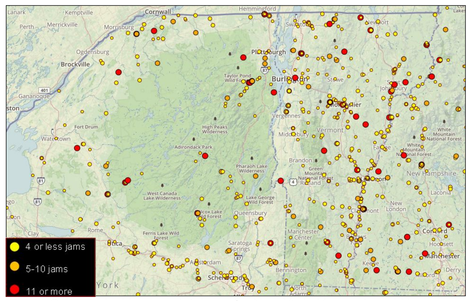


Figure 3: Historical ice jam database for New York, Vermont, and New Hampshire from USACE CRREL.

Contributing Conditions to Ice Breakup

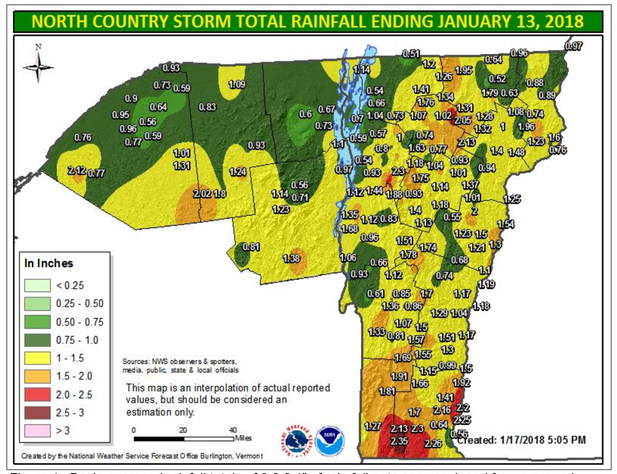


Figure 4: Basin averaged rainfall totals of 0.6-2.1" of rain fell onto snowpack and frozen ground during January 12-13.

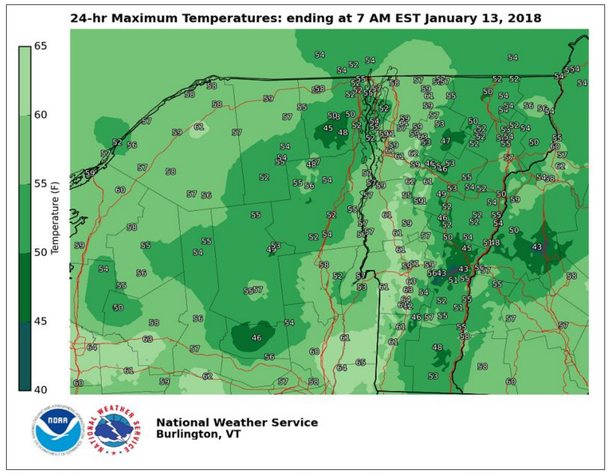


Figure 5: Record breaking temperatures in the 50s to lower 60s, more than 30°F above normal for January yielded rapid snowmelt.

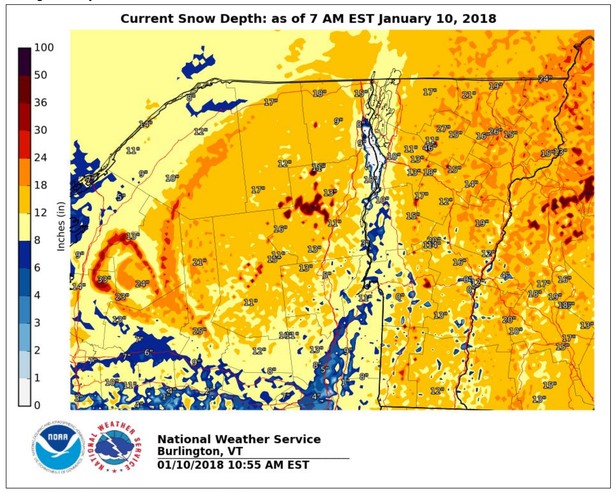


Figure 6: Antecedent snowpack 8 to 16 inches above normal.

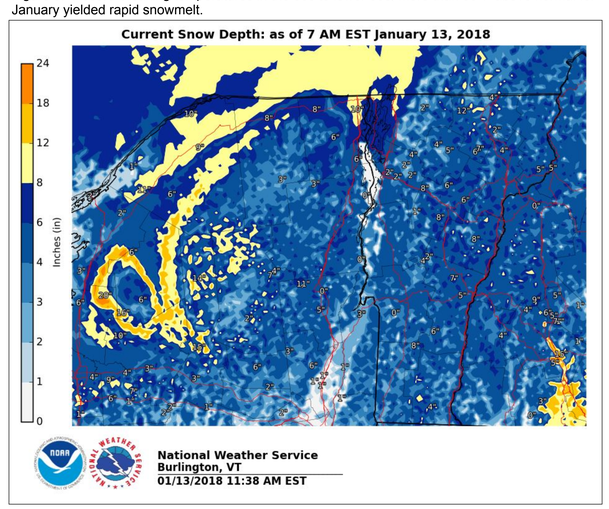


Figure 7: Snow depth the morning of January 13, 2018. 8" or more of snow depth was lost over the 3 day period. All of this extra water ran off due to frozen ground.

Decision Support Services

- Forecasters recognized threat for ice jams and communicated this to local Emergency Management officials through email and phone briefings
- Meteorologists at NWS Burlington, VT (BTV) coordinated extensively with hydrologists at the Northeast River Forecast Center (NERFC) on river forecasts
- Widespread ice jam flooding occurred across Northern New York and Vermont as seen in Figure 8
- Forecasters supported individual town managers through on-site visits, phone calls, and email briefings
- DSS provided the needed lead time for Emergency Managers to order evacuations, preventing any casualties
- Connected local officials in the town of Johnson, VT with engineers at US Army Corps of Engineers (USACE) Cold Regions Research and Engineering Lab (CRREL) to plan mitigation efforts
- Multiple gages depict ice affected hydrographs, shown in Figure 9.
  - Many rivers did not reach flood stage at the gage, though had extensive flooding nearby
  - Forecasters were heavily reliant on ground reports from town officials and law enforcement to add impact statements to flood warnings

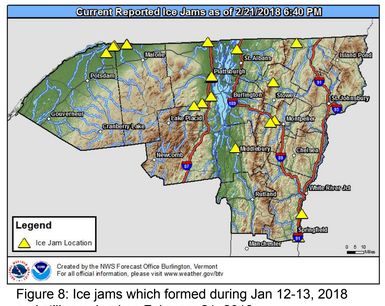
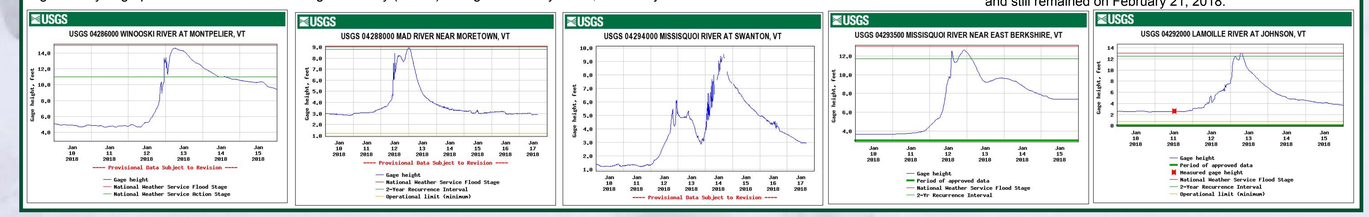


Figure 8: Ice jams which formed during Jan 12-13, 2018 and still remained on February 21, 2018.

Figure 9: Hydrographs from United States Geological Survey (USGS) during the January 12-13, 2018 ice jam event.



Aftermath

- In Johnson, Vermont, high water on the Lamoille River backing up from an ice jam along State Route 15 flooded the post office and grocery store.
- As a result of NWS messaging, home evacuations were performed in Swanton, VT along the Missisquoi River and in Plattsburgh, NY along the Saranac River.
- The ice jams in Swanton and Johnson remained in place for over a month and resulted in a prolonged period of time that NWS Burlington provided Decision Support Services (DSS).


Photo courtesy of Reg Beliveau, Village of Swanton EM


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Photo courtesy of JD Wilson, NY State OEM


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