Summary of Duluth Flash Flood Event

June 19th-20th 2012

National Weather Service, Duluth, MN
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On June 18th, the National Weather Service in Duluth issued a flash flood watch for northeast Minnesota, including Duluth, in effect for June 19th and 20th; with a forecast of 2 to 4 inches with locally higher amounts.

Tuesday evening, June 19th, a warm front slowly lifted north over Minnesota and became a focus for ongoing thunderstorms over the western Lake Superior Region. By 700 pm, June 19th, the National Weather Service in Duluth updated the forecast and stated, "A high end and life threatening flash flood event appears to be developing across a large part of northern Minnesota."

By 100 am, Tuesday night, the Duluth Airport had received 4.14 inches of rain and extensive flooding in the Duluth area was reported. This rain fell over a period of roughly 6 hours. The intense rain and thunderstorms persisted through the night and into Wednesday, June 20th. The thunderstorms finally ended when a strong cold front crossed through the region Wednesday afternoon.

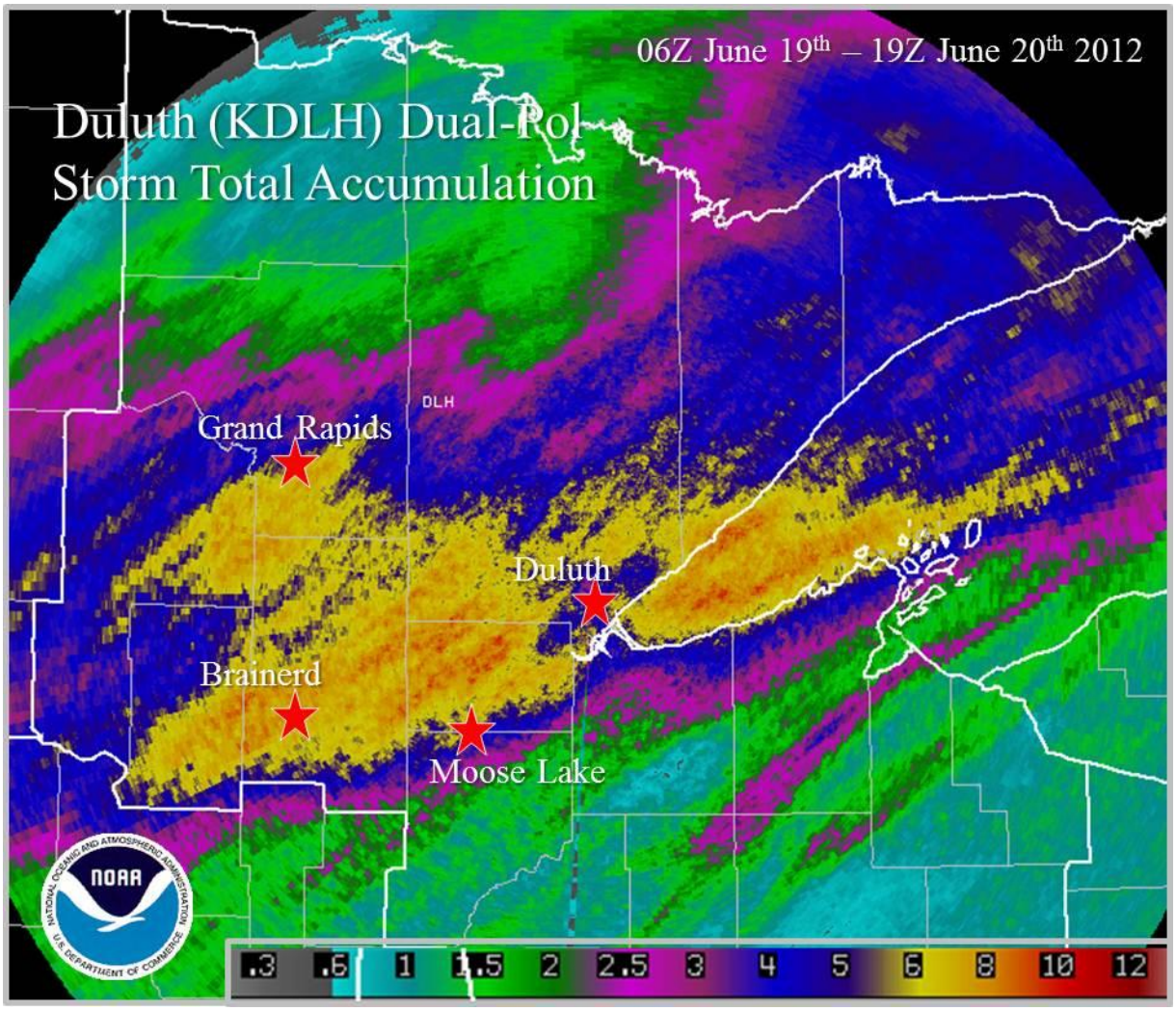
The final 2-day rainfall total at the Duluth Airport was 7.25 inches. Locally higher amounts in the 8-10 inch range were reported throughout Duluth neighborhoods. The Duluth Airport set several new records during the June 19-20th, 2012 period. Below is a listing of these new records.

Rainfall Total	Location
10.10	4 NE Duluth
9.49	Morely Heights Neighborhood (5 NE Duluth)
9.00	Denfeld Neighborhood (2 SW Duluth)
8.87	Alborn
8.52	Piedmont Heights Neighboorhood (2 WSW Duluth)
7.95	5 NW Two Harbors
7.41	4 E Island Lake
7.31	Hermantown, 1 mile West of Midway on 194
7.25	Duluth Airport (official NWS climate location)
5.75	9 ENE Boulder Lake
5.05	Proctor
4.68	3 E Floodwood

Records Broken	Previous Duluth Record		New Duluth Record	
	Rainfall	***Date***	***Rainfall***	***Date***
Greatest 24-hr Precipitation	5.79"	August 22-23, 1978	6.90"	June 19-20, 2012
Greatest 2 Day Precipitation	6.68"	July 20-21, 1909	7.25"	June 19-20, 2012
Greatest June 24-hr Precipitation	4.00"	June 23, 1876	6.90"	June 19-20, 2012
Greatest Precipitation on a June Calendar Day	4.00"	June 23, 1876	4.14"	June 19, 2012
Greatest Precipitation for June 19th	1.55"	June 19, 1998	4.14"	June 19, 2012
Greatest Precipitation for June 20th	1.77"	June 20, 1926	3.11"	June 20, 2012

The 24 hour rainfall at the Duluth Airport of 6.90 inches far exceeded the 50, and 100 year flood values which are roughly 4.75 and 5.25 inches respectively.

For perspective, the 30-year climatological normal precipitation for the month of June in Duluth is 4.23 inches. It is worthy of noting that 1.88 inches of rain, nearly half of the monthly normal, was measured at the Duluth Airport during the week preceding this event, proving to have saturated the grounds.



The above image is the Duluth dual-pol radar estimated rainfall accumulation from midnight on June 19th, through the afternoon of June 20th.

Note:
The area of lower estimated rainfall values around Duluth is not-representative. This is an artifact of the radar known as of the "cone of silience". This is due to the radar beam's inability to scan overhead, resulting in an under-estimation since much of the rain is not detected in the immediate proximimty of the radar location.

In addition to the extensive flash flooding, the intense rainfall also resulted in significant river flooding. A new historical river crest of 16.62 feet was set at Scanlon on the Saint Louis River. The old record was 15.80 feet set on May 9th, in 1950. Flood Stage at this location is 10.5 ft.

Historical River Crests at Scanlon

(1) 16.62 ft on 06/21/2012
(2) 15.80 ft on 05/09/1950
(3) 13.93 ft on 04/23/1979

Below is a hydrograph of the river stage at Scanlon during the flooding event. The blue line dictates the observed river stage during the time period of June 19th through June 22nd 2012. The dotted purple line is the forecasted river stage issued by the North Central River Forecasting Center the morning of June 22nd. This hydrograph shows the dramatic rise in the river stage from the night of June 19th through June 20th, and then cresting on the 21st.

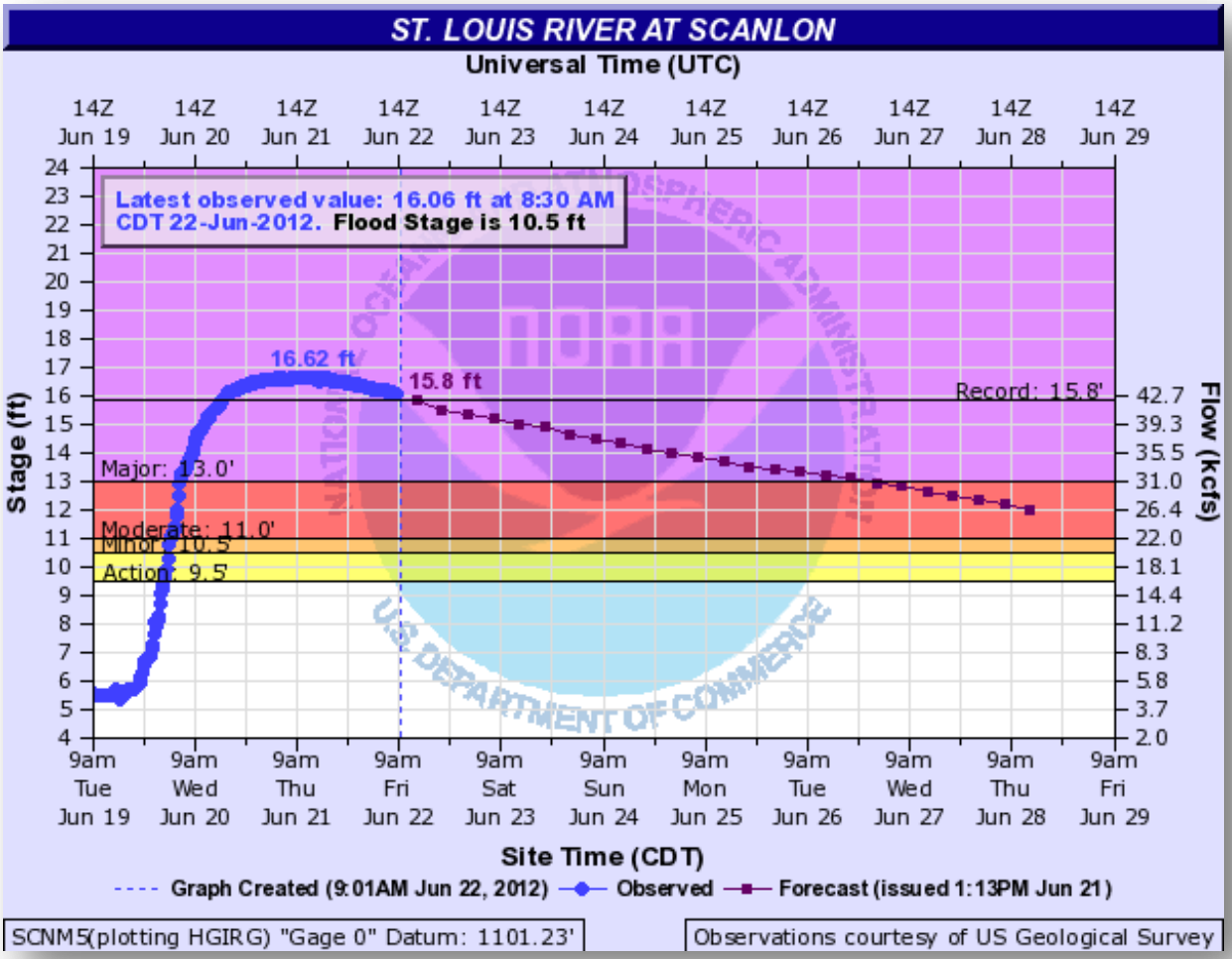
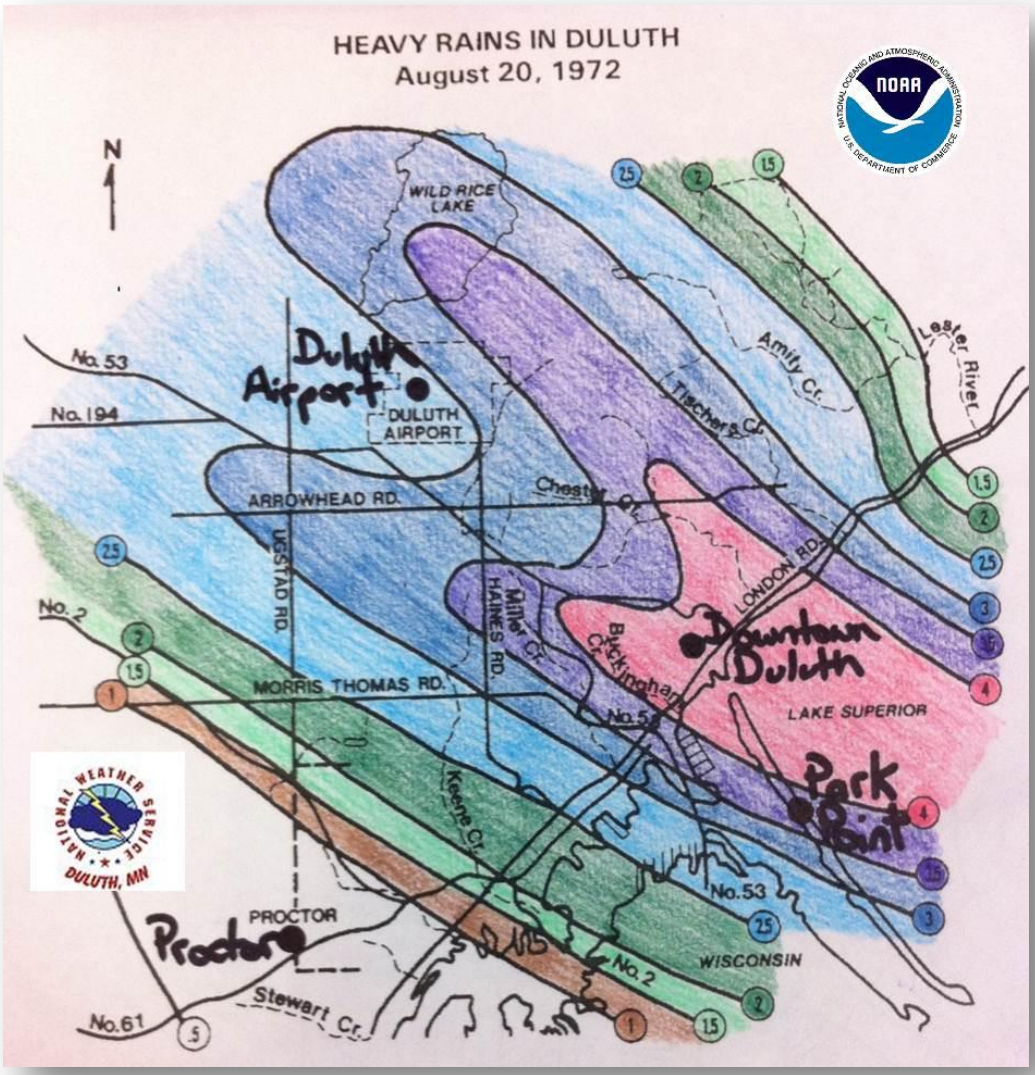


Photo of River Inn Bar near Scanlon River Gage on Saint Louis River. June 22nd, 2012.
Photo by Amanda Graning

Comparable rainfall events in Duluth's history would be the thunderstorms of September 5th-6th, 1876 that brought 6.48 inches of rainfall; July 20th-22nd, 1909 that brought 7.83 inches and possibly the most well-known, the flood of August 15th-21st, 1972 that brought 7.91 inches of rain to Duluth.

The image below is a rainfall map from August 20th, 1972; one day of a prolonged rain event. The contours range from 2.5 inches in light blue, to 4 inches in red. This flash flood was unique in that the heavy rains were spread over a 6-day day period. The Duluth weather service office, located at the Duluth Airport reported a storm total of 7.91 inches.

Photo of First Avenue West in Duluth, August 1972



Duluth Airport Rainfall Amounts

- August 15th = 1.31"
- August 16th = 2.51
- August 17th = 0
- August 18th = 0.14
- August 19th = 0
- August 20th = 2.95"
- August 21st = 1.00"

6 Day Storm Total: 7.91"

Only a month after the August 1972 flood in Duluth, another round of rain brought a swath of 4 to 5.5 inches of rain to the Duluth community between the hours of 4:00 am and 2:00 pm. The Duluth airport recorded a rainfall amount of 3.42 inches during this eight hour period.

There were two fatalities with this storm and nearly 100 graves were washed up.

The image below is a rainfall map from the flash flood of September 20th, 1972. The contours range from 4 inches in light blue to 5.5 inches in red.