The Disturbing Recent Heavy Precipitation Trend Across Parts of the Upper Mississippi River Valley

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Motivation

• Has it been raining more? flooding more?
Motivation

• Has it been raining more?

August 23 2016
Flash Flood Emergency
5-8” rain / 5-6 hours
3 record river crests

August 27-28 2018
Flash Flood Emergency
10-12” rain
Flood of Record: Kickapoo River
Really? Is this the new normal?

- 2016: La Crosse: Wettest on record (prev: 85.1” 1996-7)
- 2018-9: Rochester 86.8” Snowiest on record (prev: 85.1” 1996-7)
- 2018: Harmony: 60.21” State Annual Rainfall Record (prev record 56.24”)
- 2019: Rochester: Wettest (51.74”, thru Nov 18)
- Mississippi River: La Crosse Spring 2019 Records
  - 40 consecutive days above flood stage (prev: 30 days)
  - 121 days above “action stage” (prev: 73)
1977-1997 Annual Mean Precipitation

Normals: ~30-35”
Normal: ~30-35”
Nearly 1 foot higher than previous 40 year max!
2018 Precipitation: Records

HOW WET IS 2018?

TOP 10 ON RECORD  WETTEST ON RECORD

Data retrieved on Dec 11, 2018
Source: Applied Climate Information System
2018 Precipitation: Percent Normal

January 01, 2018 Annual Percent Precipitation
Created on: January 03, 2019 - 17:28 UTC
Valid on: January 01, 2019 12:00 UTC

150-200% of Normal
Annual Number of Days with Precipitation ≥ 1 in
Trend based on 1900–2017 (Days per century)
- Percent of Days >= 1”
- 1970 to 1999
- ~1.75% or ~6.5 days per year

http://scacis.rcc-acis.org/
Percent of Days >= 1"
1990 to Oct 20, 2019
~ 2.25% or ~ 8 days per year

~8 days
- Percent of Days $\geq 1''$
- 2005 to Oct 20, 2019
- $\sim 2.75\%$ or $\sim 9$ days per year
- Percent of Days $\geq 1"$
- 2016 to Oct 20, 2019
- $\sim 4\%$ or $\sim 14-15$ days per year
- DOUBLING over the 1970-1999 normal values!
• Percent of Days >= 2"
• 1970 to 1999
• ~ 0.3% or ~ 1 day per year
• Percent of Days >= 2”
• 1990 to Oct 20, 2019
• ~ 0.4 % or ~ 1.5 days per year
• Percent of Days $\geq 2''$
• 2005 to Oct 20, 2019
• $\sim 0.6\%$ or $\sim 2$ days per year
• Percent of Days $\geq 2”$
• 2016 to Oct 20, 2019
• $\sim 1-1.25\%$ or $\sim 4$ days per year
Accumulated Precipitation Tool
Location: 43.95, -91.16 in La Crosse Co., WI, Start Date: January 1

2016

https://mrcc.illinois.edu/DEWS/indicators/
Rank: Jan 1 - Nov 15 2019 (~70 Years)
2019 Record Annual Precipitation

Records began in late 1800s
Current 2-Day Rainfall Records
1969-2019 NWS La Crosse COOP (45 total)
Annual Mean Discharge (cfs)
Kickapoo River at La Farge, WI (1939-2019)

2016-2019: 85% above the mean!
Top 50 Mean Streamflow Days
1970-2019 Kickapoo River at La Farge, WI

Data Provided by:
NOAA
National Weather Service
La Crosse, WI

USGS
Science for a changing world
Annual Mean Discharge (cfs)
Trempealeau River at Dodge, WI (1939-2019)

Mean: 487

Data Provided by:
NOAA
National Weather Service
La Crosse, WI
Annual Mean Discharge (cfs)
Oconto River at Gillett, WI (1939-2019)

Mean: 561
Annual Mean Discharge (cfs)
Chippewa River at Chippewa Falls, WI (1939-2019)

Mean: 5250
Annual Mean Discharge (cfs)
Cedar River at Charles City, IA (1965-2019)

Mean: 865

Data Provided by:
2012 Drought
1993 Flood
2012 Drought
Top 5 Historical Crests @ 48 River Gauges in NWS La Crosse Area (to 2018)
Long Term Trends (Climate)

https://www.youtube.com/watch?v=JObGveVUz7k
Long Term Trends (Climate)

Global Temperature Departure From 20th Century Average: 1900-2018

Source: NASA GES Surface Temperature
Analysis and maps by Brian Bretschneider

Standard Deviations from 20th Century Average
[Each category has equal chance of occurrence]
Your backyard is not representative of global weather/climate.

Overall, the average October global air temperature was +1.04°C above 1951-1980 climate baseline (+1.27°C above the 1880-1920 baseline).

OCTOBER – 2019

DATA: National Snow & Ice Data Center, Boulder CO (Sea Ice Index v3, 1979-2019*)
SOURCE: http://sidacs.colorado.edu/DATASETS/NOAA/
GRAPHIC: Zachary Labe (@ZLabe)
Long Term Trends (Climate)

While sea ice thickness observations are sparse, here we utilize the ocean and sea ice model, PIOMAS (Zhang and Rothrock, 2003), to visualize September sea ice thickness and volume from 1979 to 2019.