Summary of the 2019 Spring and Summer Kansas Flooding

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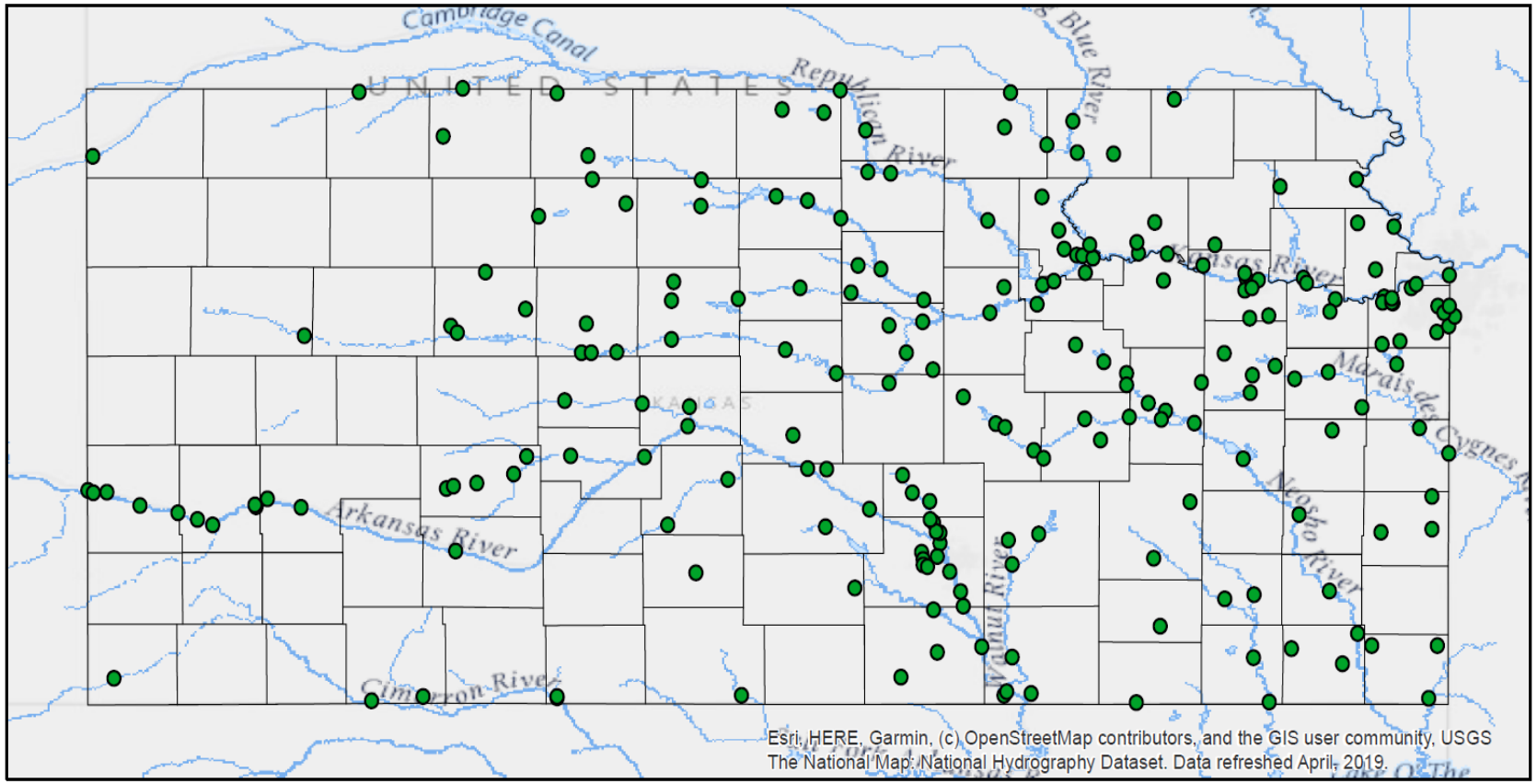
Governor's Conference on the Future of Water in Kansas
November 7-8, 2019

U.S. Department of the Interior
U.S. Geological Survey

Kansas continuous streamflow monitoring network



Legend

- USGS continuous streamflow monitoring station

Miles
0 20 40 80 120 160

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Who uses USGS data?

- Reservoir Operators and Designers
  - Corps of Engineers, Bureau of Reclamation, non-federally operated reservoirs
- Water Managers
  - Kansas Water Office, Kansas DWR, local management districts
- Emergency management
  - National Weather Service, city, and county emergency managers
- Researchers
  - USGS research, Universities, other Federal Agencies, consulting firms
- City planners
  - Flood mapping and storm water runoff design
- Engineers
  - Design and sizing of bridges, culverts, and smaller impoundments
- Cities, Tribes, Recreational uses

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And many more!

What does the USGS do?

Streamflow measurements

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What does the USGS do?

Other fieldwork

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Highlights

- Above normal precipitation in WY 2019 caused short and long term flooding in the Midwest United States
- Above normal precipitation also caused reservoirs in Kansas to reach record elevations, leading to a deviation in release rates for Kansas River Basin reservoirs
- Neosho River at Burlington, KS, Little Arkansas River near Sedgwick and Halstead, KS recorded noteworthy peaks

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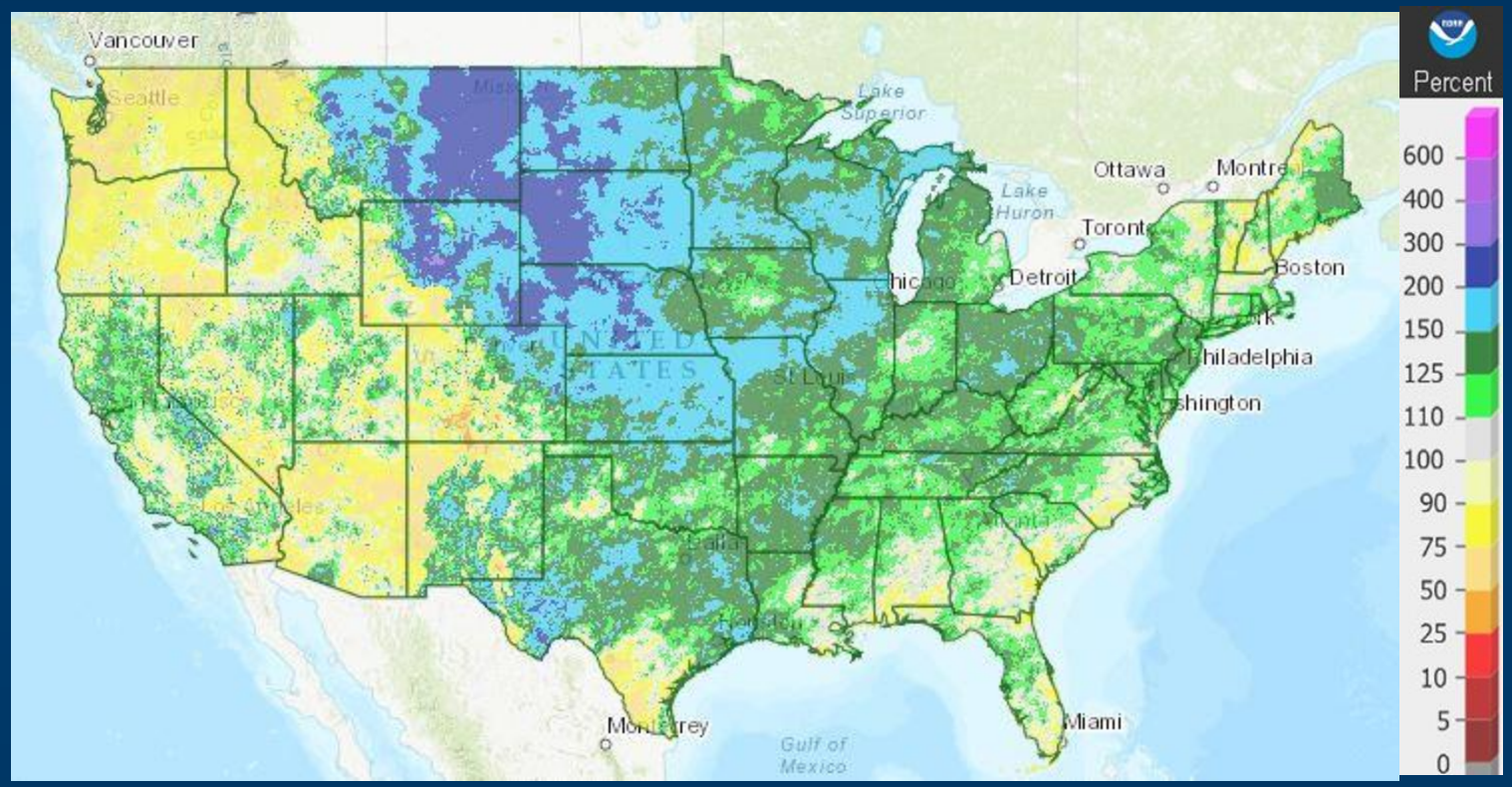
Precipitation – Percent of normal



Percent of normal (30 year average) precipitation for continental United States during WY 2019.

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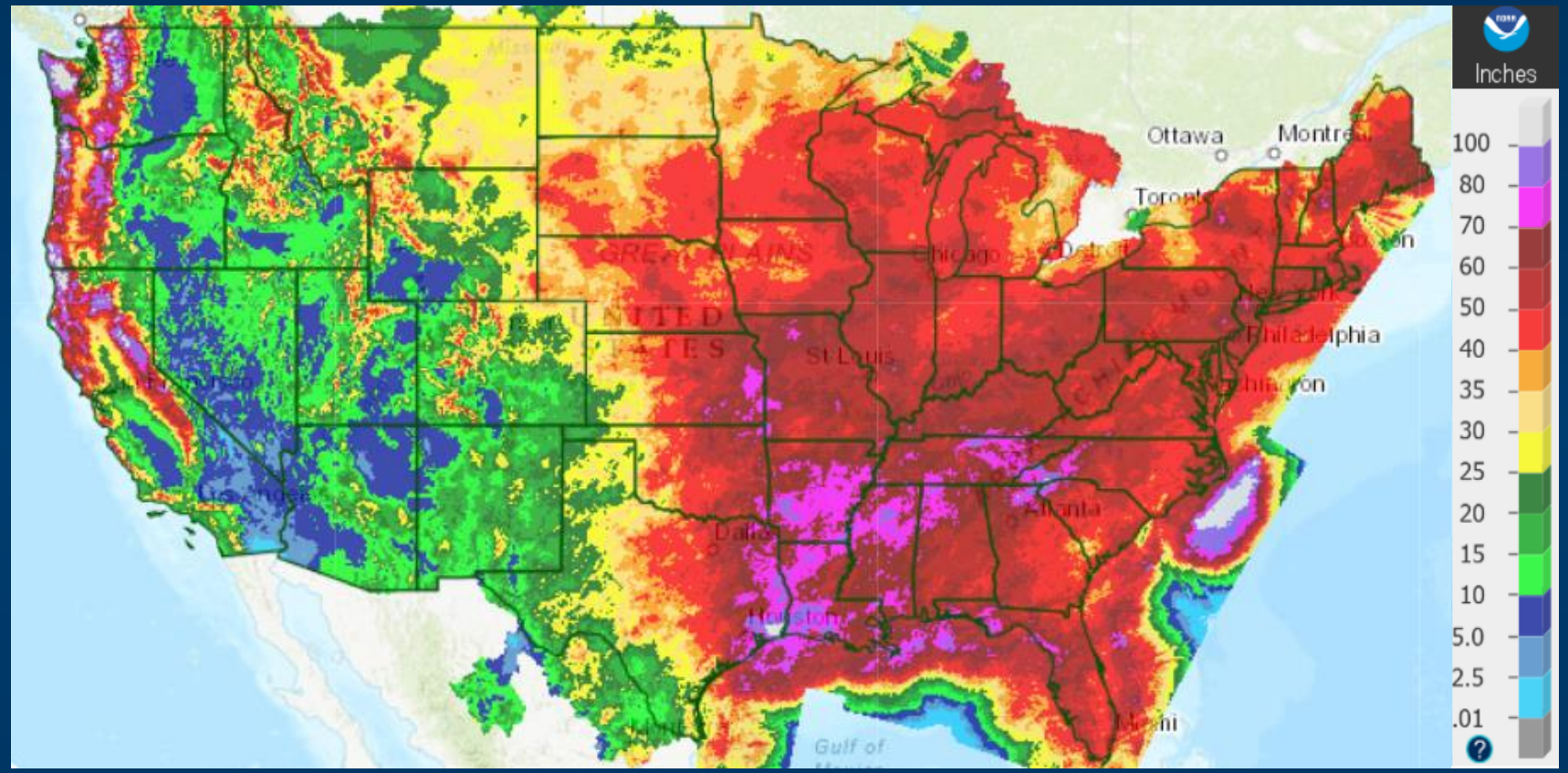
https://water.weather.gov/precip/

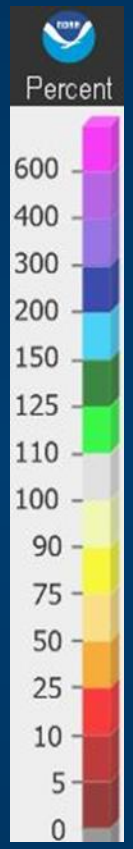
Precipitation - Observed



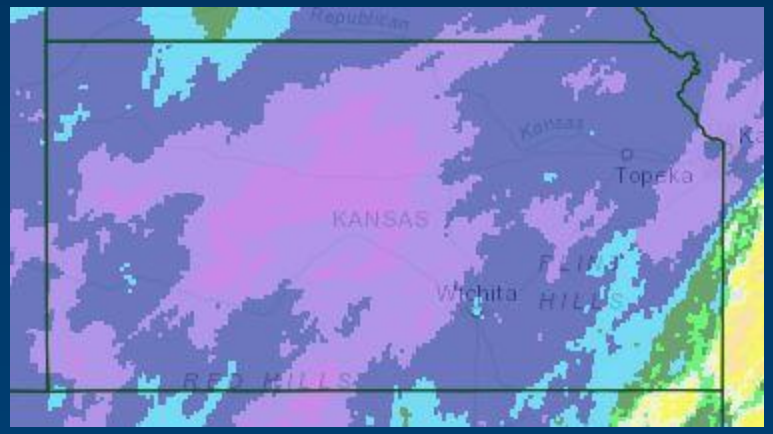
Observed precipitation in inches for the continental United States during WY 2019.

https://water.weather.gov/precip/

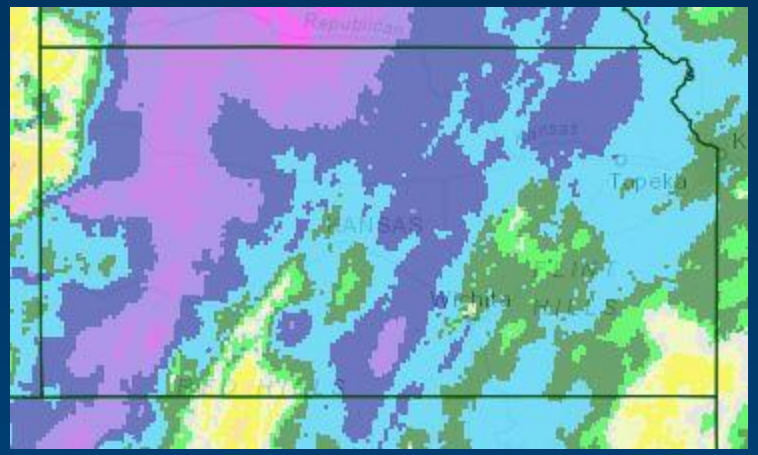
Monthly Precipitation



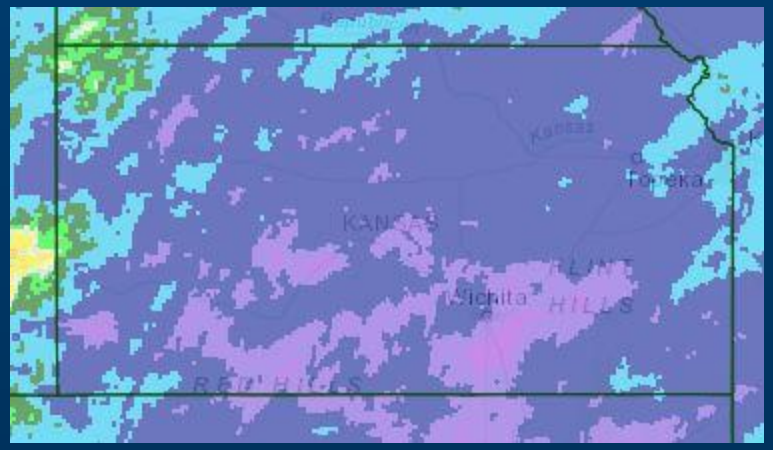
October 2018



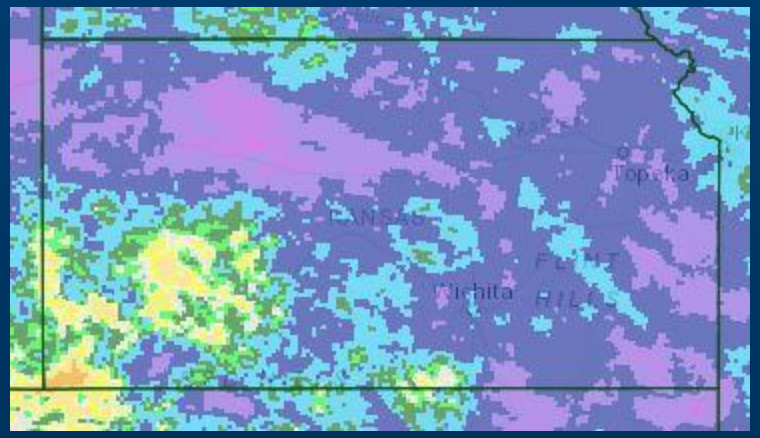
December 2018



May 2019



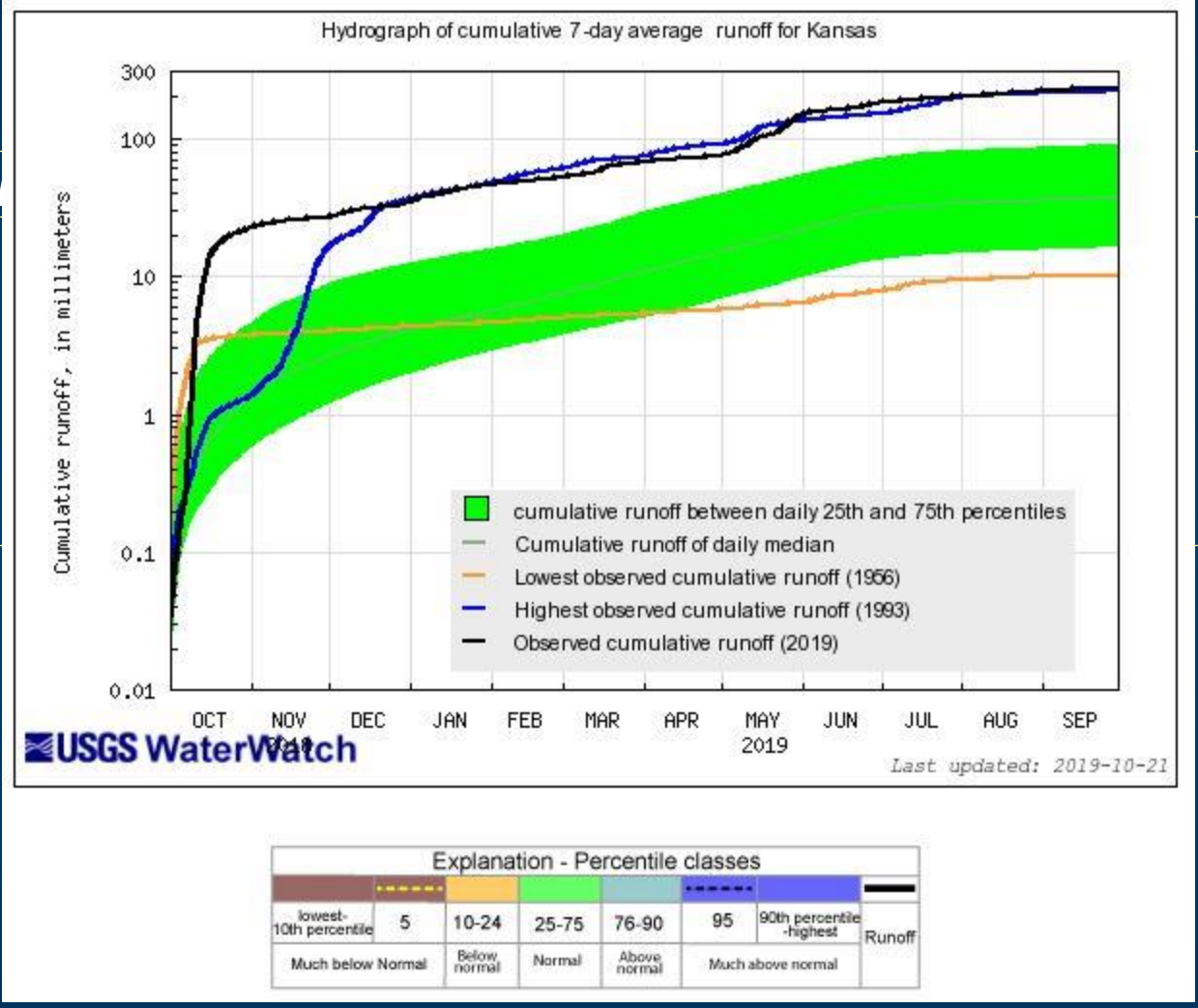
August 2019



https://water.weather.gov/precip/

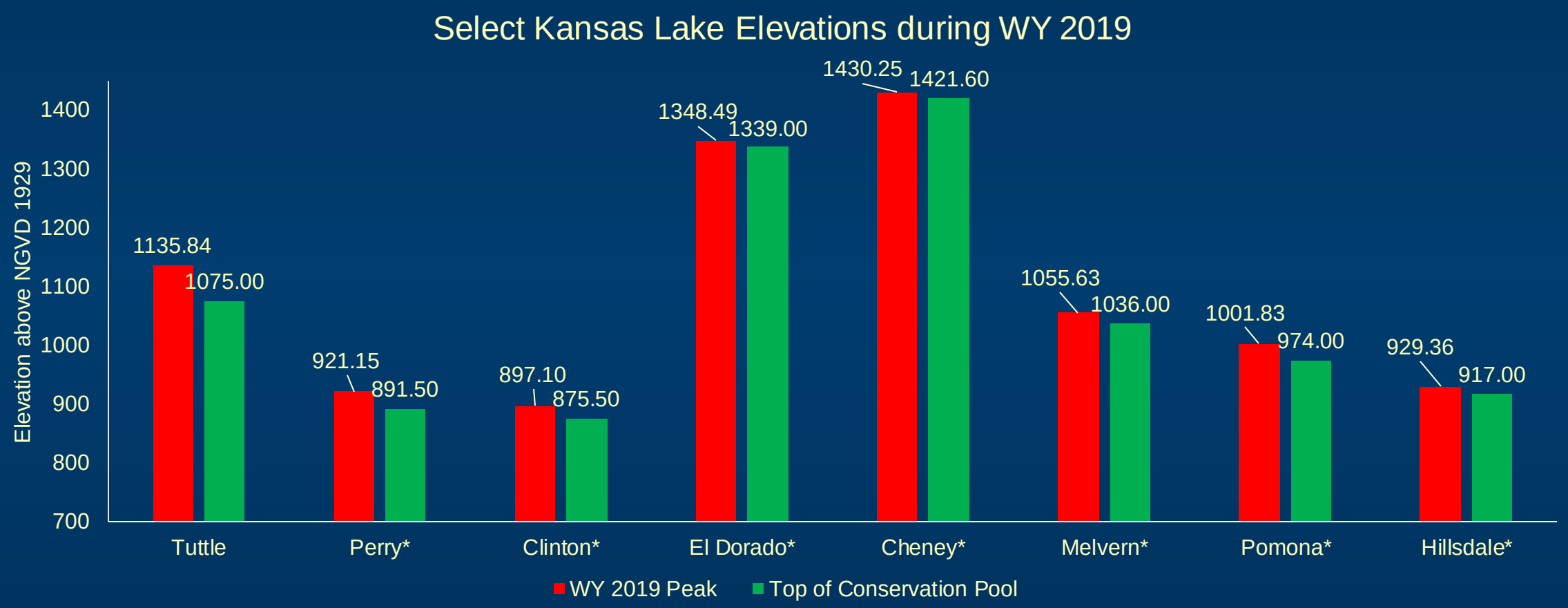
Runoff

State	M	p25	p50	p75
Kansas		16.2	37.6	90.5
Nebraska		27.6	36.3	51.1
South Dakota		12.0	18.0	30.2
Iowa		71.6	138	261
Missouri		108	186	334



https://waterwatch.usgs.gov/index.php

Reservoir Elevation



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Data from National Water Information System and Tulsa District USACE

Adjusted release rates for Kansas River Basin Reservoirs

- Decision was made in consultation with the Missouri River Basin Water Management
- Retaining flood storage in the Kansas River reservoirs into the next flood year presents increased risk
- Drawdown of these reservoirs should take about 3 months, future precipitation could delay
- Real-time data from USGS was a critical tool for this decision
- Improvement from the 1993 event when real-time data was not as available

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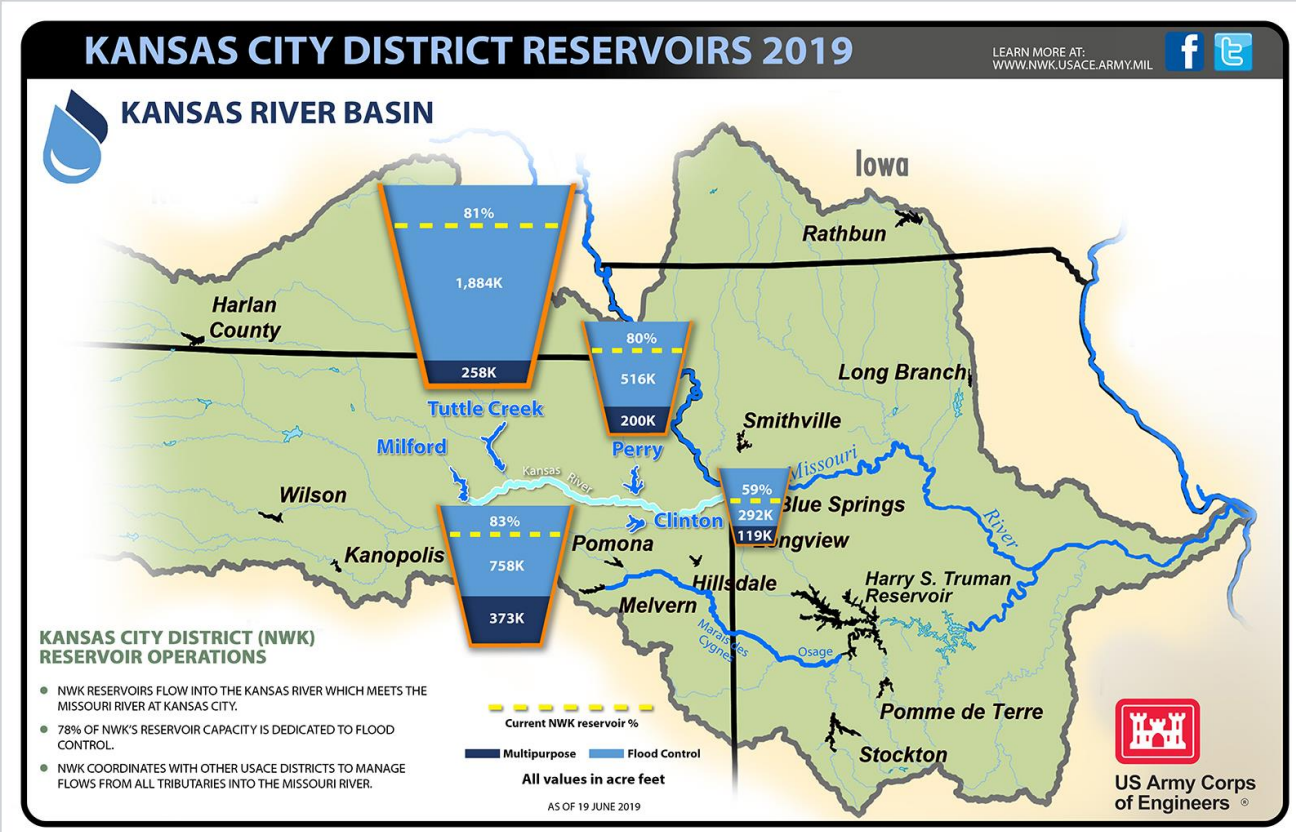
Adjusted release rates for Kansas River Basin Reservoirs



https://www.nwk.usace.army.mil/Media/Images/igphoto/2002147284/

Flooding

WY 2019 Flood Table

State	*Gages Flooded*	*>30 days*	*>90 days*	*>180 days*	*Gages in Major Flood Stage***	*Record Peaks**
Kansas	110	15	2	1	9	3
Nebraska	71	8	6	5	27	12
South Dakota	92	24	17	7	35	13
Iowa	113	30	9	4	29	4
Missouri	120	37	18	3	30	3

*Gages with 10 or more years of data

**Major Flood Stage is determined by the National Weather Service

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Missouri River Flooding

Missouri River Flooding		
Site No.	***Station Name***	***Days above Flood Stage***
06818300	Missouri River at Atchison, KS	103
06820475	Missouri River at Leavenworth, KS	75
06813500	Missouri River at Rulo, NE	248
06810070	Missouri River at Brownville, NE	237
06807000	Missouri River at Nebraska City, NE	233
06453020	Missouri River below Greenwood, SD	143
06486000	Missouri River at Sioux City, IA	3
06818000	Missouri River at St. Joseph, MO	232
06895500	Missouri River at Waverly, MO	222
06894650	Missouri River at Napoleon, MO	218

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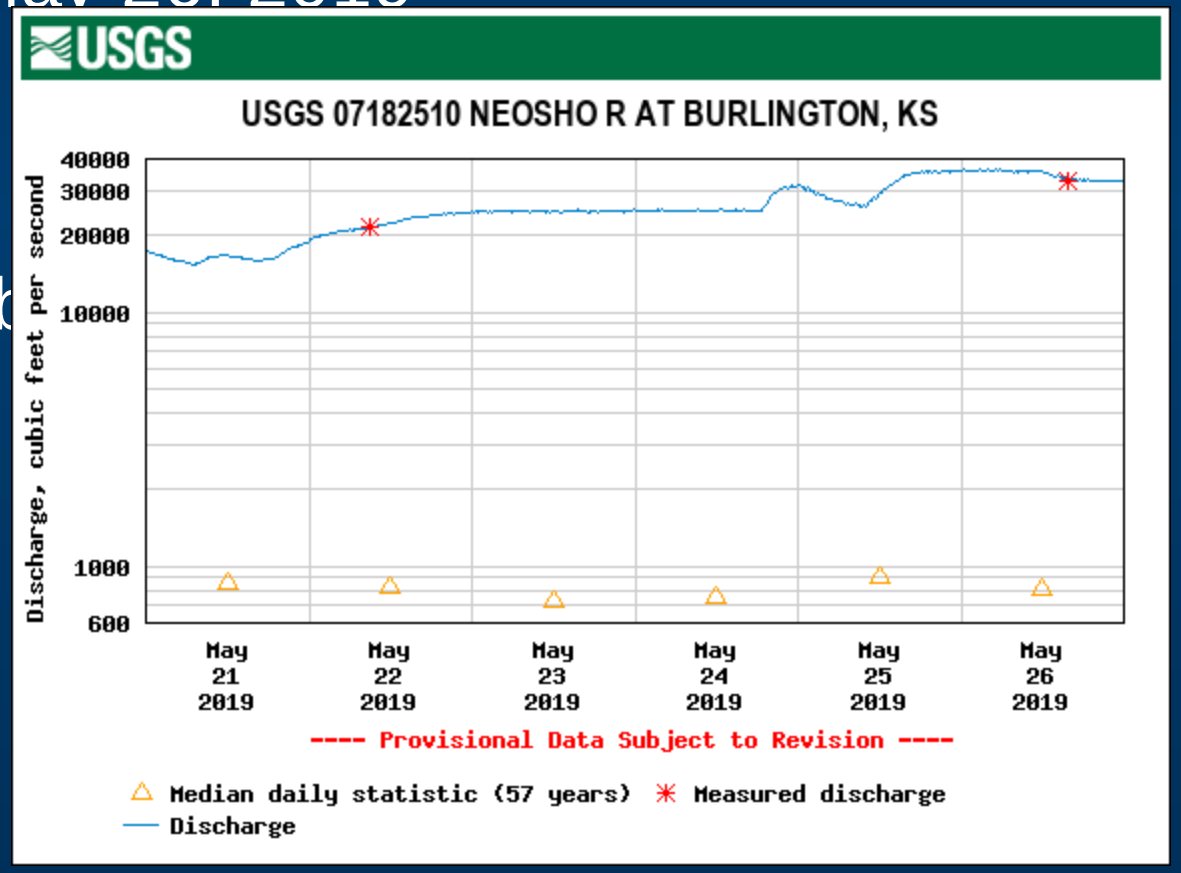
Selected Streamgages

- Neosho River at Burlington, KS (07182510)
- Peak of record occurred on May 26, 2019
- Recorded stage was 32.73 ft
- Streamflow was 36,500 ft^3/s
- Note: This gage is regulated b



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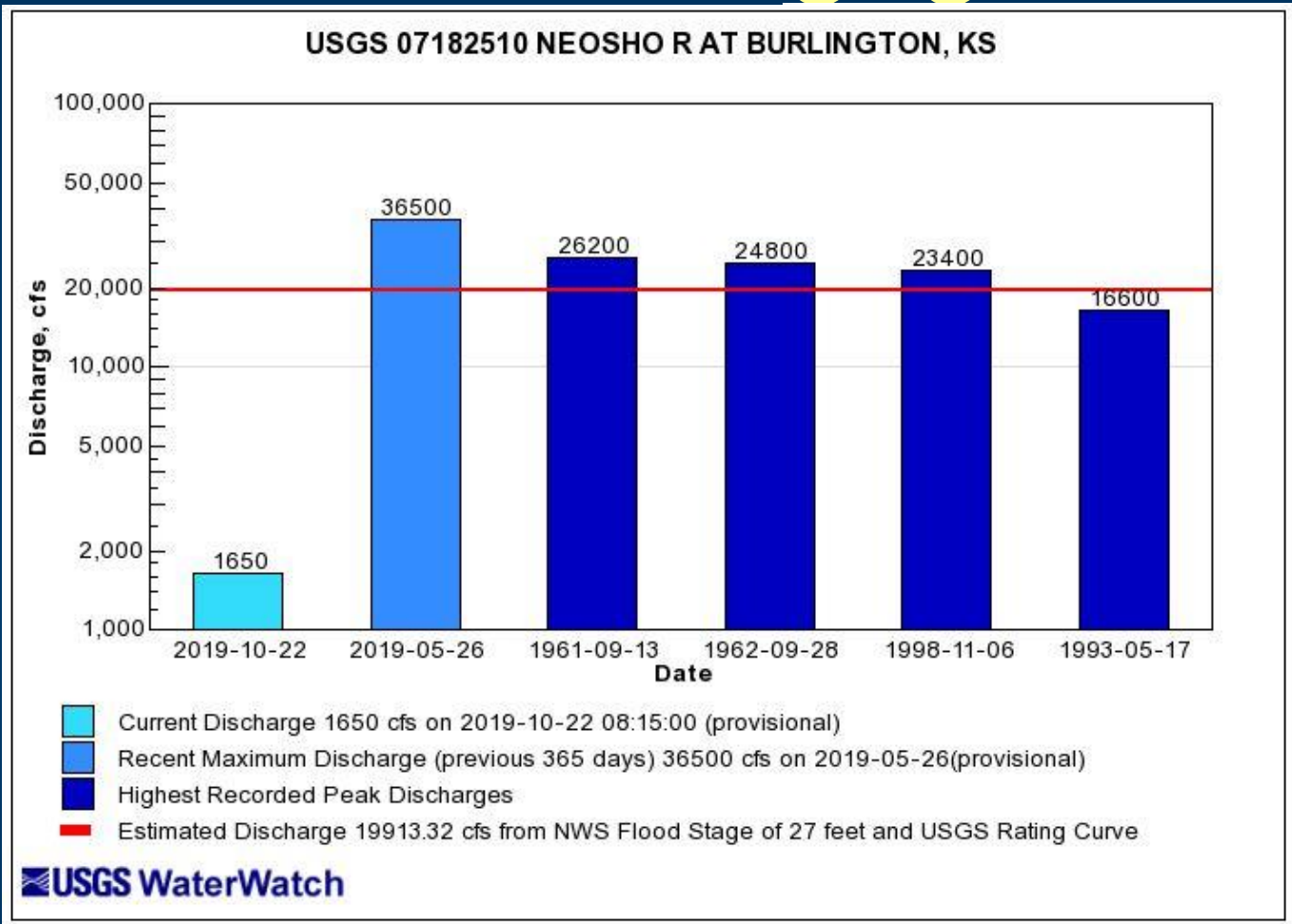
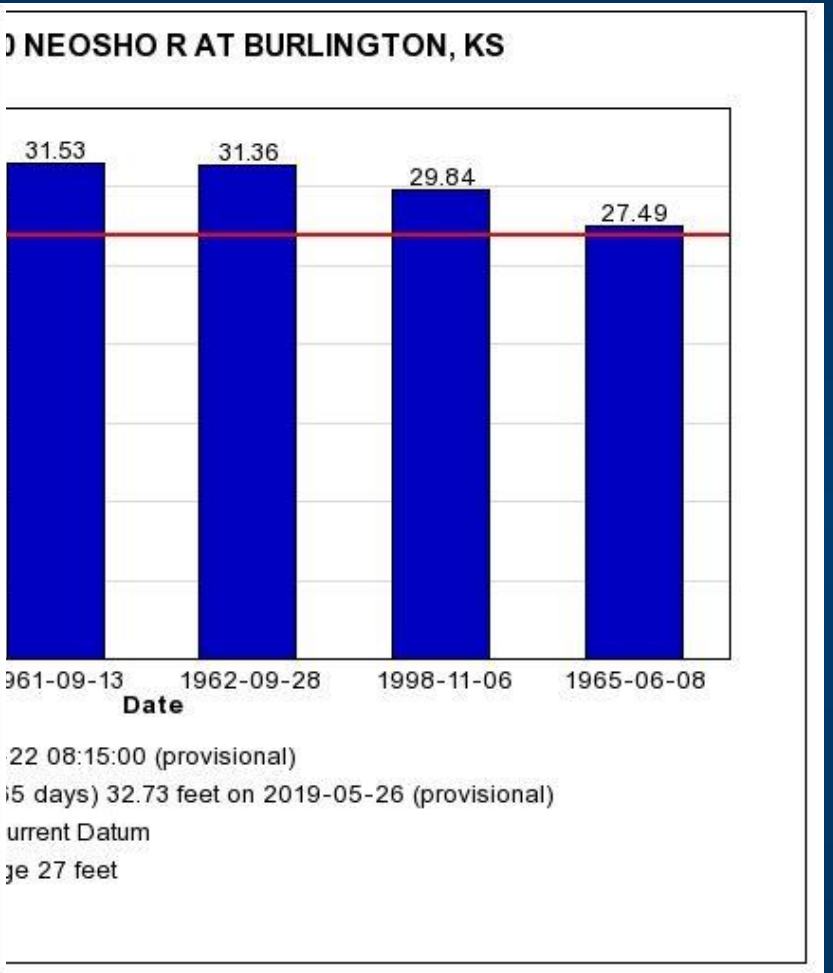
Selected Streamgages





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Selected Streamgages

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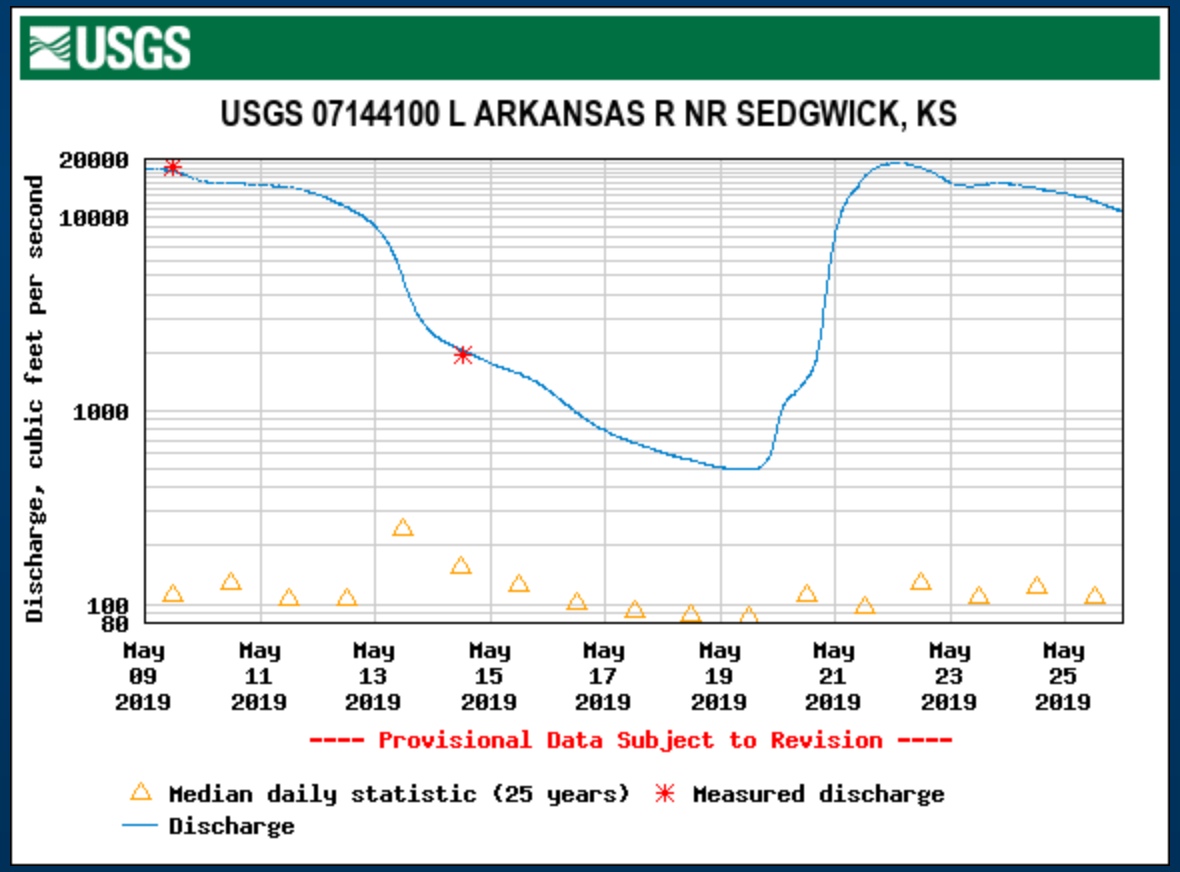
Selected Streamgages

- Little Arkansas River near Sedgwick, KS (07144100)
- Peak of record occurred on May 22, 2019
- Stage recorded was 25.82 ft
- Streamflow was 19,400 ft^3/s
- Flood Stage is 22 ft
- 24 years of data



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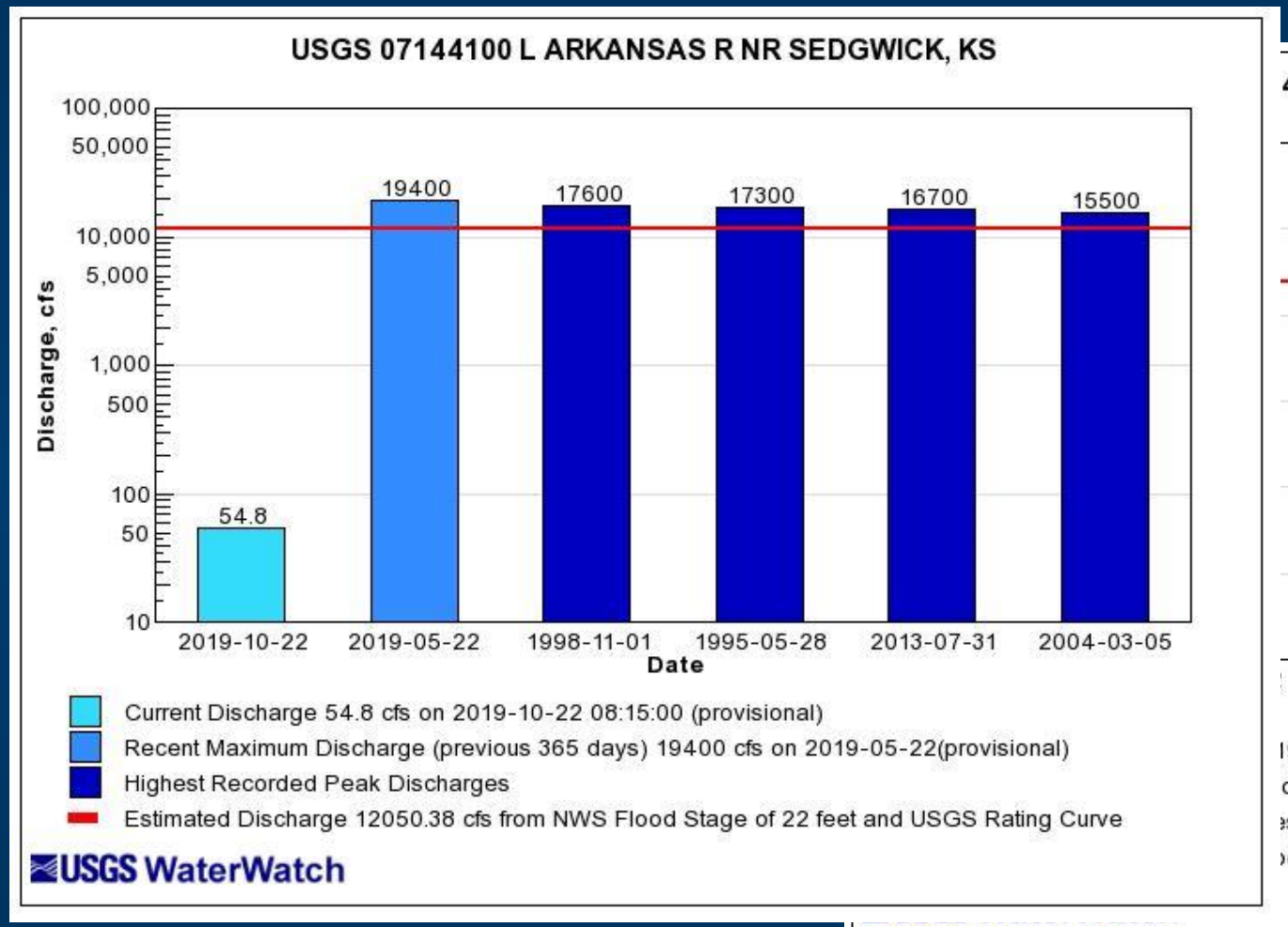
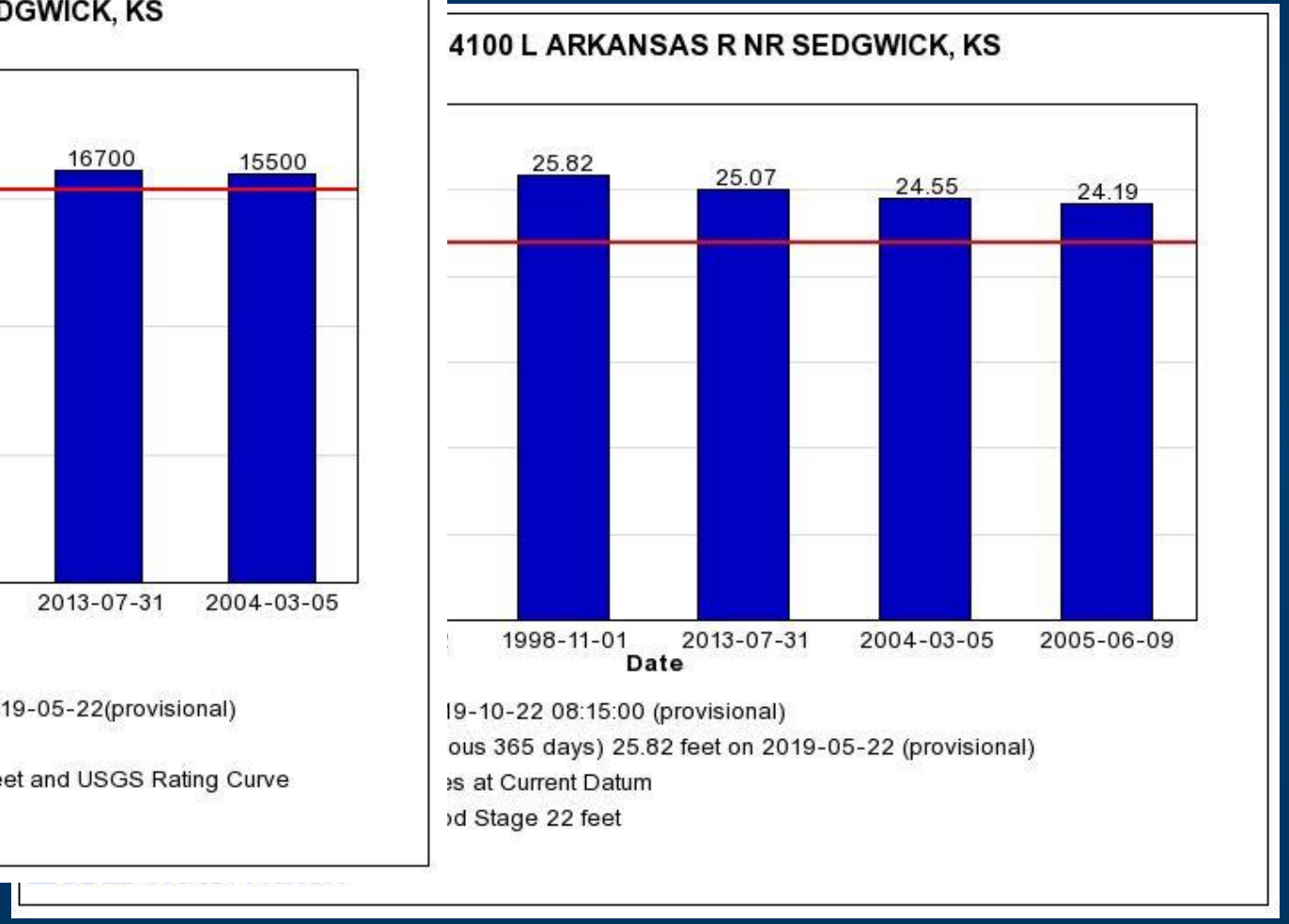
Selected Streamgages





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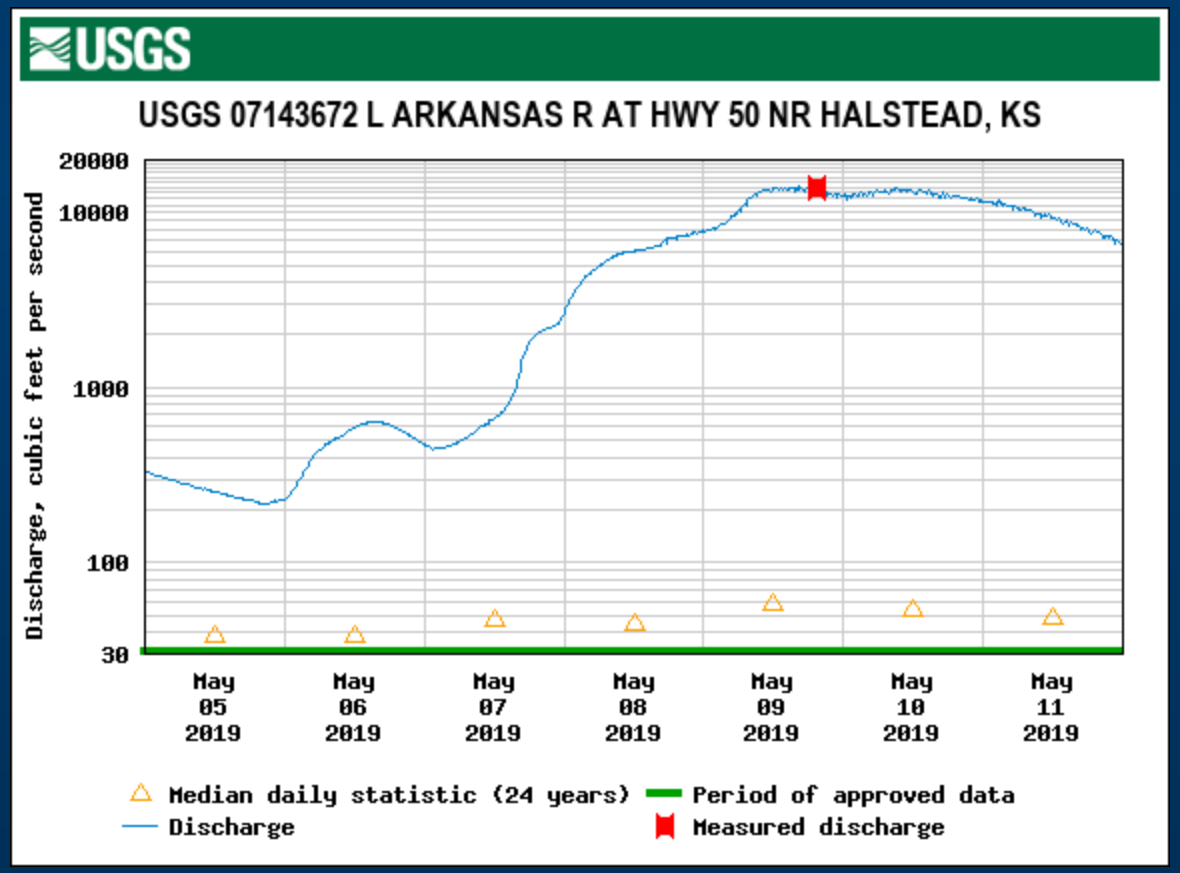
Selected Streamgages

- Little Arkansas River at Hwy 50 near Halstead, KS (07143672)
- Peak of record occurred on May 9, 2019
- Stage recorded was 27.12 ft
- Streamflow was 13,700 ft^3/s
- Flood stage is 25 ft
- 22 years of data



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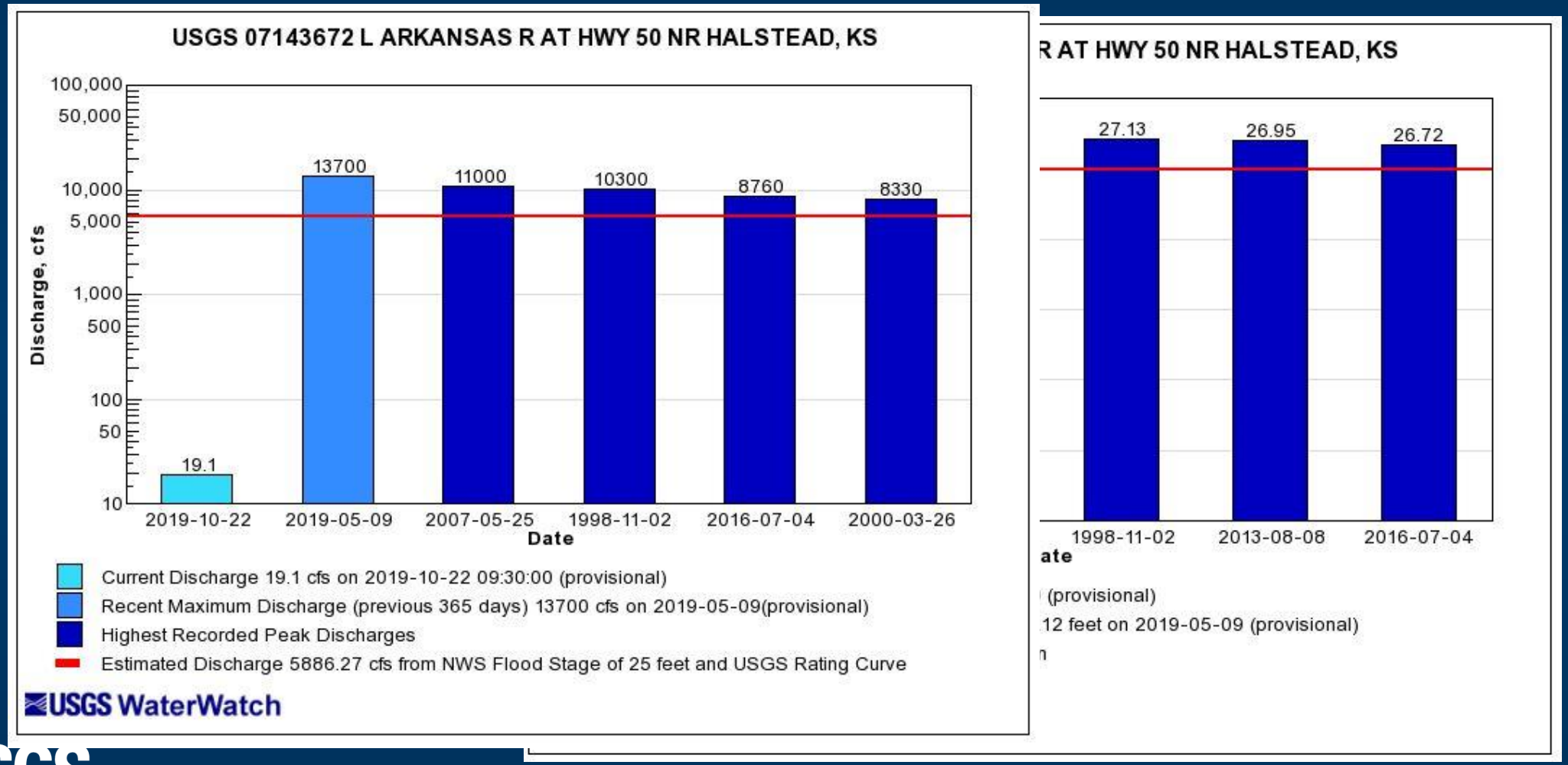
Selected Streamgages



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Summary

- Above normal precipitation in WY 2019 caused:
  - Short and long term flooding in the Midwest, including Kansas
  - Record Kansas Reservoir elevations and a deviation in the release rates of the Kansas River Basin reservoirs to avoid an increased flood risk
- Three Kansas streamgages had record peaks in May 2019
  - Burlington, KS gage on May 26
  - Near Sedgwick, KS gage on May 22
  - Near Halstead, KS gage on May 9

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Questions

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Anticipated Questions-Flood Stages

- **Bankfull Stage** - an established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank somewhere in the corresponding reach. The bankfull stage on many streams is associated with the 2-year recurrence interval flood.
- **Action Stage** - the stage which, when reached by a rising stream, represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. Gage data should be closely monitored by any affected people if the stage is above action stage.
- **Flood Stage** - an established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood advisories or warnings is linked to flood stage. Not necessarily the same as bankfull stage.

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Anticipated Questions-Flood Stages

- **Minor Flooding** is defined to have minimal or no property damage, but possibly some public threat.
- **Moderate Flooding** is defined to have some inundation of structures and roads near the stream. Some evacuations of people and/or transfer of property to higher elevations may be necessary
- **Major Flooding** is defined to have extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary.

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Anticipated Questions

- https://www.omaha.com/news/local/with-little-flood-storage-at-gavins-point-corps-of-engineers/article_e828ab99-a292-5ecc-9529-c94d36aae670.html

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