



The NHWC Transmission

January/February 2020

CONTENTS

- USACE Reservoir Ops 1
- US Hydrologic Conditions 4
- Calendar of Events 5
- Call for Articles 5
- Parting Shot 5

Click on hyperlinks located throughout this newsletter for more information.

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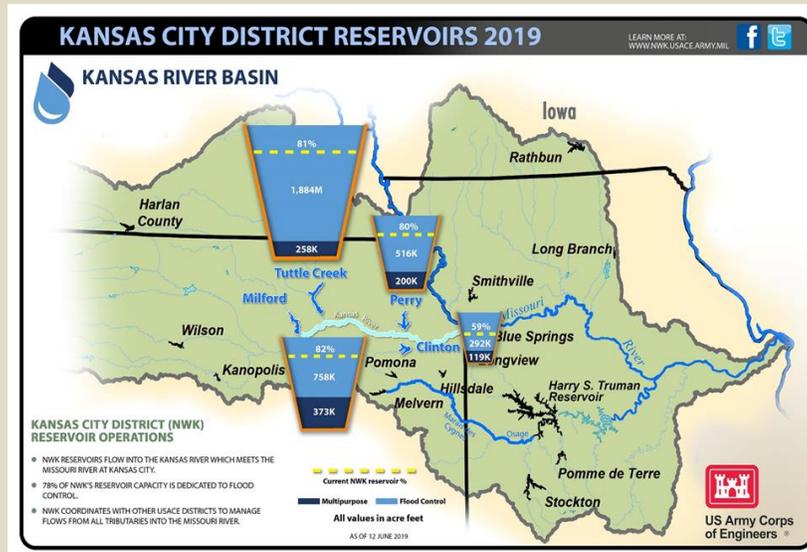
Historically high precipitation levels in 2019 strengthen knowledge of reservoir operations, analyses and reporting in the Corps' Kansas City District

Paul R. Simon, P.E., U.S. Army Corps of Engineers

In the 2019 water year, which extends from October 1, 2018 through September 30, 2019 over 80 inches of rain fell across parts of the Kansas City District's area of operation. The percent of normal precipitation for the District ranged from 110% to over 300%. A large portion of the greater Missouri River Basin from the Dakotas downstream through St. Louis, received over 150% of normal precipitation. The excess rainfall across the basin led to the largest annual volume of water passing the Hermann Missouri River gage in recorded history.

At the peak of the flood event, which spanned from March until mid-December, District reservoirs stored approximately 9 million-acre-feet, or MAF, of the 11 MAF - 82% - available for combined flood storage on June 2, 2019. The empty flood control pool at each reservoir project is the storage available to reduce downstream flooding. The flood control pool is divided into three phases, one on top of the other. Each phase corresponds to an appropriate flow target below the dam and at control points along the river.

This phased approach helps balance the risk associated with storing water in the reservoir with potential flooding downstream. The surcharge pool sits on top of the flood control pool. When water begins to accumulate here, releases as large as necessary are scheduled to protect the dam because of the monumental damage and costs associated with overtopping and failure.



Infographic of the Kansas River Basin reservoir operations and status update as of June 12, 2019.

The quantity and timing of storage and releases from our reservoirs reduced the peak of the flood on the Missouri River at Hermann from an unregulated flow of approximately 663,000 cubic feet per second to 403,000 cfs. The flood event last year stretched on for months leading to the longest Emergency Operations Center (EOC) activation in Kansas City District history at 279 days. Water Management is tasked with managing flood control storage and releases from 18 District and 11 U.S. Bureau of Reclamation reservoirs across the District, forecasting future reservoir elevations, and coordinating with internal and external partners. In my opinion, engineers are tasked by society with the responsibility of putting life safety first. Once that very important condition is met, Water Management must balance all the congressionally authorized purposes for each reservoir both individually and collectively as a system in each basin.

We hold back water due to flooding on the Missouri River or tributaries, which increases water levels potentially causing negative impacts around those lakes. Releases from a reservoir to protect the safety of the dam and people downstream can compound flooding that is already occurring.

To help manage all of these (sometimes opposing) interests, the District works with the Northwestern Division, our higher headquarters, the National Weather Service (NWS), U.S. Bureau of Reclamation, US Geological Survey (USGS), Southwestern Power Administration (SWPA), and state, county and local emergency managers to mitigate negative impacts to the public while working within Corps guidance.

To help us manage all this information we use the Corps of Engineers Water Management System (CWMS). CWMS is an integrated system of hardware and software models that begins with the receipt of hydrometeorological, watershed, and project status data. These data are then processed, stored, and made available through a user interface to the water manager to evaluate and model the watershed. It incorporates a database, several software modeling applications, and reservoir operation guidance from the respective Water Control Manuals and Basin Master Manuals associated with each reservoir.

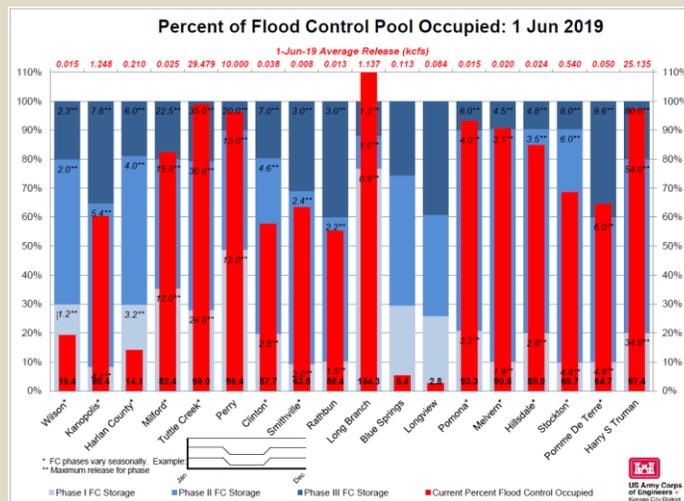
With CWMS we can estimate inflows into

Corps reservoirs, and predict how high the pool elevations may rise, how much uncontrolled runoff may occur below our projects, and the timing and duration of these flood hydrographs. Results may be shared using tables, graphs, and mapping.

The Kansas City District schedules releases based on water-on-the-ground only philosophy. We do not operate, nor do we have the authority to operate based on rain in the forecast.

Water Management receives gridded precipitation data, radar data, forecasted flows for river gages, and reservoir inflow estimates from the NWS. The USGS provides gage data and verification of flood discharges, while the U.S. Bureau of Reclamation provides reservoir environmental and release data for their projects.

At Stockton and Truman reservoirs we coordinate the release of flood storage through SWPA for the regional benefit of hydropower generation, which also requires coordination with Ameren, the owners of Lake of the Ozarks below Truman Dam. In turn, we also share forecasted operations for our reservoirs with the NWS and the public to help improve the NWS' river forecasts and inform the public of what conditions can be expected in the near future at our projects and in the downstream reaches below our dams.



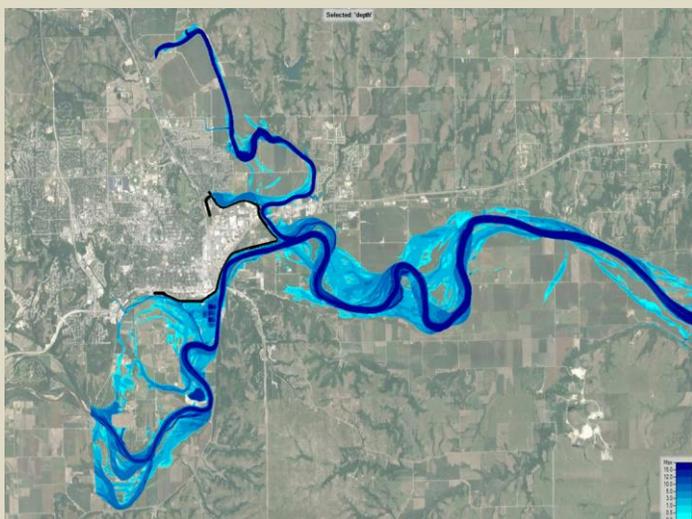
Flood Storage Situational Bar Chart

We work closely with the NWS to employ our CWMS models to understand how rain in the forecast may impact our release decisions. Standardized reports, mapping and other products from our CWMS models help communicate current conditions and potential risks due to rain and alternative operating decisions. Throughout

the 2019 flood, Water Management staff produced a bar chart along with a situational report during flooding events that shows the releases and percent of flood pool occupied for each of our reservoirs. At a glance you can see how much of the available flood storage is currently being used and which if any of the projects are in surcharge.

Reservoir forecasts and current conditions at the Reservoirs can be found at <https://www.nwk.usace.army.mil/Locations/Water-Management/>, along with current river conditions. The [NWK Daily Reservoir Data](#) link gives the current condition of each project in the District including U.S. Bureau of Reclamation projects. The [8-Day Reservoir Report](#) link gives the elevation, inflow, and outflow for USACE projects in the District for today and the last 7 days. The [3-Day Reservoir Forecast](#) link provides current pool elevation and release information for each USACE Reservoir in the District along with the forecast for the next three days based on no future precipitation. Our partners and the public can also reach us at 816-389-3545.

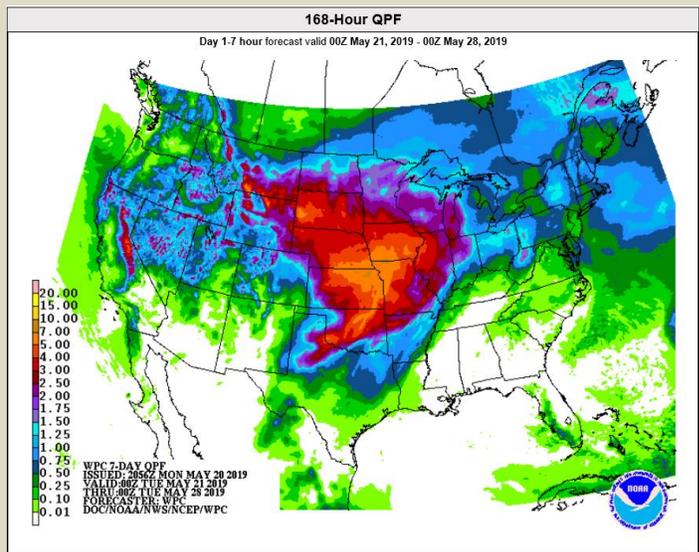
During flood events we receive many calls from concerned citizens. One may want to make large releases because their property is upstream of one of the dams and is flooded by the high pool elevation, another may call because they have a home or business along the river and are concerned about how much we are releasing. During the peak of the flooding we coordinated surcharge releases with state, county, and local emergency managers, sharing release magnitude, timing, and potential inundation mapping as conditions change.



Manhattan, Kansas forecasted inundation map associated with May 2019 flood flows.

Other national tools to share information include CWMS Mobile and Access to Water. CWMS Mobile offers tailored, real time data in a mobile friendly way. Access to Water allows you to search or use the mapping tool to find information you need. Regionally, one of the newest tools the Kansas City District has adopted to help manage risk in cooperation with Benton County Missouri, is the Rave Alert system. This system allows for real time communication with the public and provides individuals with the information needed to stay safe or take precautions during hazardous or emergency situations.

With every flood event the Kansas City District and the U.S. Army Corps of Engineers as a whole, strives to improve processes and communication with other agencies and the public. This past year hydraulic engineers from Kansas City District were collocated with the NWS office in Pleasant Hill to help forecast the interaction between channel flow and overbanks as levee breaches occurred along the river.



Many of the tools used to assess and minimize damages due to flooding have been evolving for years with the help of our cooperators, as exemplified by this daily forecast product.

With this help the NWS forecasters had addition information to aid in their work, helping the public and other agencies understand the potential timing and magnitude of flooding along the river. All the hard work from USACE staff and partner agencies came together to help keep the public safe. We are committed to world-class engineering solutions and providing as much benefit to the American people as possible.

ALERT Users Group

28th Flood Warning Systems Training Conference and Exposition
Ventura, California

The ALERT Users Group is proud to announce their 28th Flood Warning Systems Training Conference and Exposition. The 2020 conference theme is 'Expanding the Possibilities of Early Warning Systems.'

This nationally known and respected training conference will be held in Ventura, CA, from May 5th through May 8th, 2020. This event provides valuable opportunities for training and discussion concerning effective operation, maintenance and management of real time flood warning systems.

The ALERT Users Group is aware of the challenges faced by local governments, agencies, corporations and private individuals. The ALERT Users Group is planning to address a number of these topics and concerns along with providing critical training and workshop opportunities.

The conference will also provide an opportunity to examine the latest in flood warning equipment, products, software and services, and to meet with trained sales staff who can answer technical and purchasing questions.

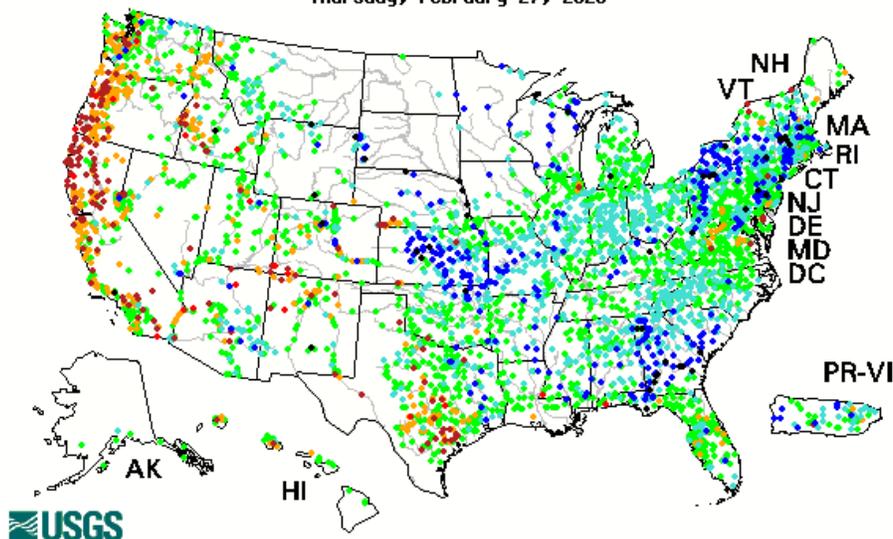
We look forward to seeing you at the 2020 ALERT Users Group's Flood Warning Systems Training Conference and Exposition!

For more information visit:
www.alertsystems.org/



Hydrologic Conditions in the United States Through February 25, 2020

Thursday, February 27, 2020

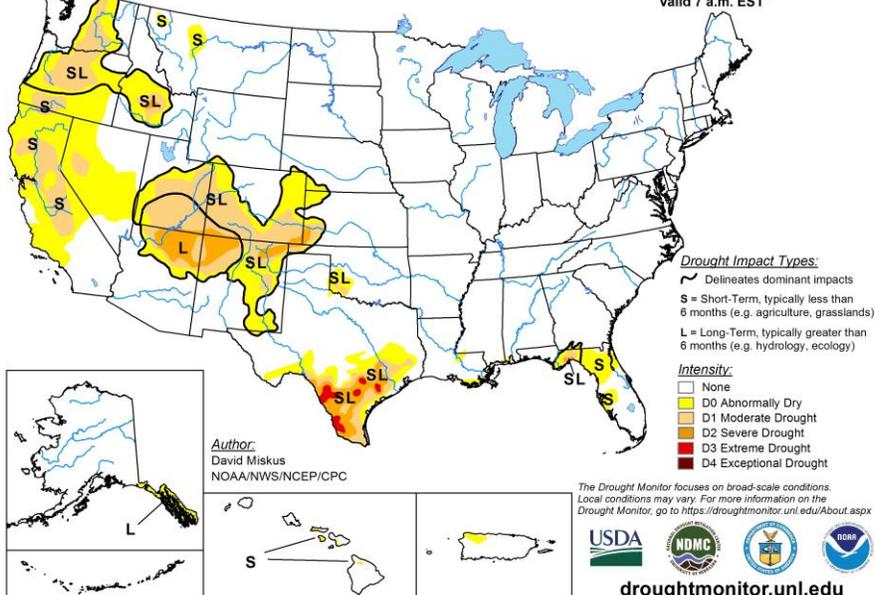


Explanation - Percentile classes						
	●	●	●	●	●	●
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High

Latest stream flow conditions in the United States. (courtesy USGS)

U.S. Drought Monitor

February 25, 2020
(Released Thursday, Feb. 27, 2020)
Valid 7 a.m. EST



Latest drought conditions in the United States. (courtesy National Drought Mitigation Center)

Call for Newsletter Articles:

The NHC is requesting articles that focus on the following topics:

Data Collection

practices, technologies and tools used to gather and disseminate real-time hydro-meteorological data

Hazard Communication and Public Awareness

practices, technologies and tools used to get the right real-time data and information to the right people for the right response

Hydrology

new methods, research, or discoveries in hydrology or a recent significant hydrologic event that helps us understand the science behind the floods

Modeling & Analysis

practices, technologies and tools used to model, predict and analyze hydro-meteorological events and to support decision making for emergency response and floodplain management

Submit your article to:

editor@hydrologicwarning.org

March 25th is the deadline for inclusion in the March/April issue.

NHWC Calendar

June 21-24, 2021 – [NHWC 14th Biennial Training Conference & Exposition](#), Breckenridge, Colorado

General Interest Calendar

May 5-8, 2020 – [ALERT Users Group Training Conference and Exposition](#), Ventura, California

June 7-11, 2020 – [ASFPM 44th Annual National Conference](#), Fort Worth, TX

September 8-11, 2020 – [Floodplain Management Association Annual Conference](#), Sacramento, California

September 20-24, 2020 – [ASDSO Dam Safety 2020](#), Palm Springs, CA

Parting Shot

Sonoita Creek, Patagonia, Arizona



The Santa Cruz County Flood Control District, Arizona installed this new ALERT precipitation/stream station on Sonoita Creek in Patagonia Arizona on February 13th, 2020. This station features a radar sensor for measuring stream stage. Realtime data may be viewed at <https://santacruz.jefulleralert.com/>

photo by **Brian Iserman**, JE Fuller/Hydrology & Geomorphology, Inc.

National Hydrologic Warning Council

*Providing Timely, Quality Hydrologic Information to Protect Lives,
Property, and the Environment*

<http://www.hydrologicwarning.org>