

Exceedance Probability Analysis for the Arkansas River Basin Events of April-May 2019



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The Hydrometeorological Design Studies Center (HDSC) analyzed annual exceedance probabilities (AEPs) for the Arkansas River Basin rainfall events that occurred during April-May 2019. Multiple rainfall events in the month of May delivered rainfall amounts that exceeded 20 inches in many locations.

AEP is probability of exceeding a given amount of rainfall for a given duration at least once in any given year at a given location. It is an indicator of the rarity of rainfall amounts and is used as the basis of hydrologic design. The rarity of this event is illustrated in the two figures below. Figure 1 shows how the maximum observed rainfall amounts compared to corresponding rainfall frequency estimates for AEPs from 1/2 (50%) to 1/1000 (0.1%) for durations from 1 day to 60 days for a rain gauge in Kansas - US1KSBU0005, Rose Hill 2.7 ESE (37.5533°N, 97.0855°W, 1279 ft elevation). The rain gauge is part of the Community Collaborative Rain, Hail & Snow Network (CoCoRaHS). The AEPs are estimates from NOAA Atlas 14, Volume 8. The upper bound of the 90% confidence interval (also called the 95% confidence limit) for 1/1000 AEP is also shown in the Figure 1 to illustrate uncertainty associated with the calculation of AEPs, which increase as the AEP becomes smaller. As seen from Figure 1, observed rainfall amounts have probabilities of less or equal to 1/1000 for durations above 15-day. Observed rainfall amounts exceed the upper bound of the 90% confidence interval of corresponding 1/1000 AEP estimates for durations approximately 20-day to 45-day. Additional rainfall forecasted over the next week will likely lead to revisions of this document, specifically for the longer durations.

The map in Figure 2 shows the areas that experienced rainfall magnitudes with AEPs ranging from 1/10 (10%) to smaller than 1/1000 (0.1%) for the 30-day duration, respectively. Rainfall amounts are derived from the [National Centers for Environmental Prediction \(NCEP\) Environmental Modeling Center \(EMC\) Stage IV analysis](#). Rainfall frequency estimates are from the [NOAA Atlas 14, Volume 8](#). The 30-day duration used for comparison within the larger observation period may vary for different locations within the analysis region. The analysis uses the highest (or worst) amount of continuous precipitation at each location during this duration. Therefore, the AEP map does not characterize isohyets at any particular point in time, but rather within the whole event period.

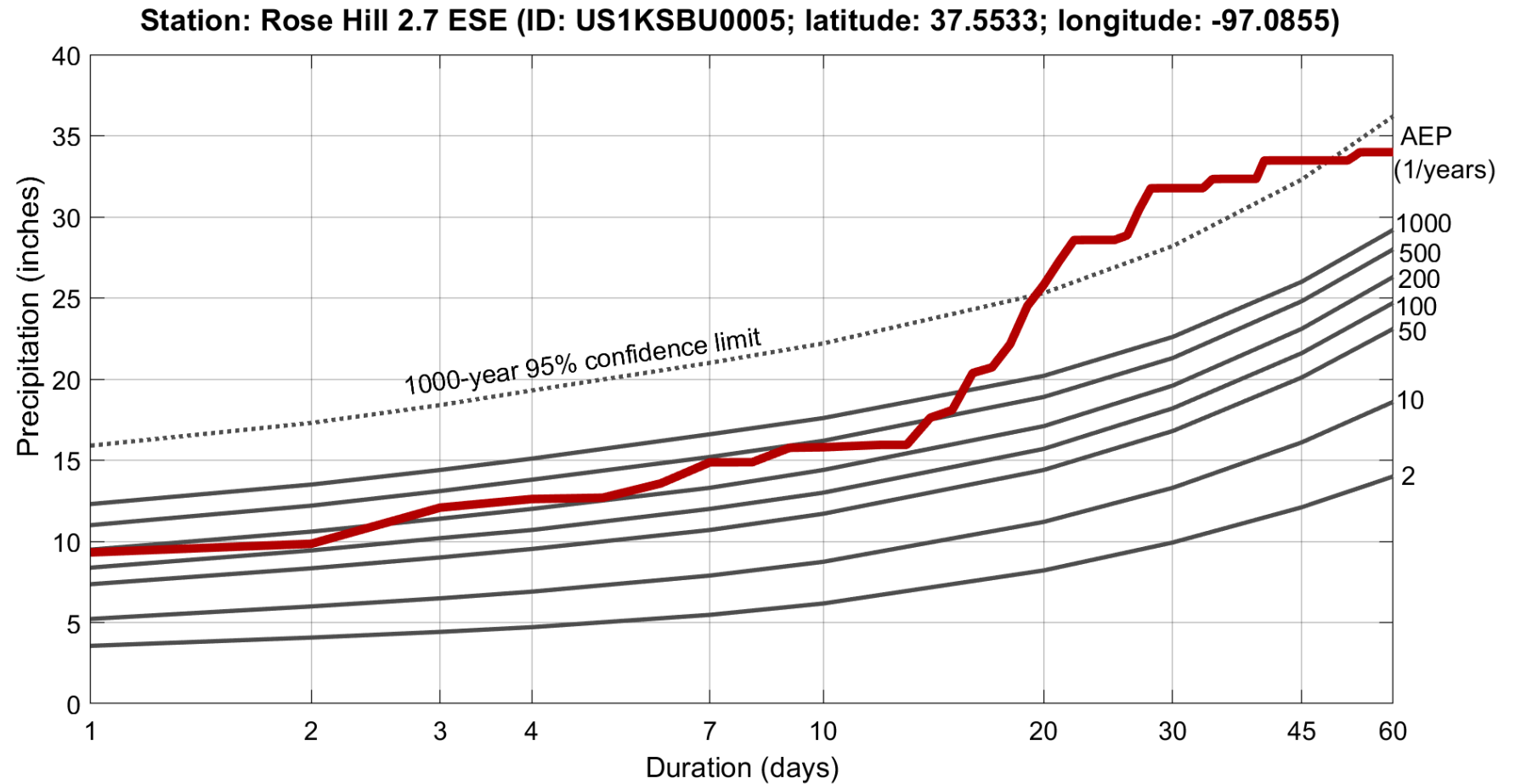


Figure 1. Maximum observed rainfall amounts from 1 April - 30 May 2019 in relationship to corresponding precipitation frequency estimates for the US1KSBU0005 gauge. [Click here](#) for standalone image.

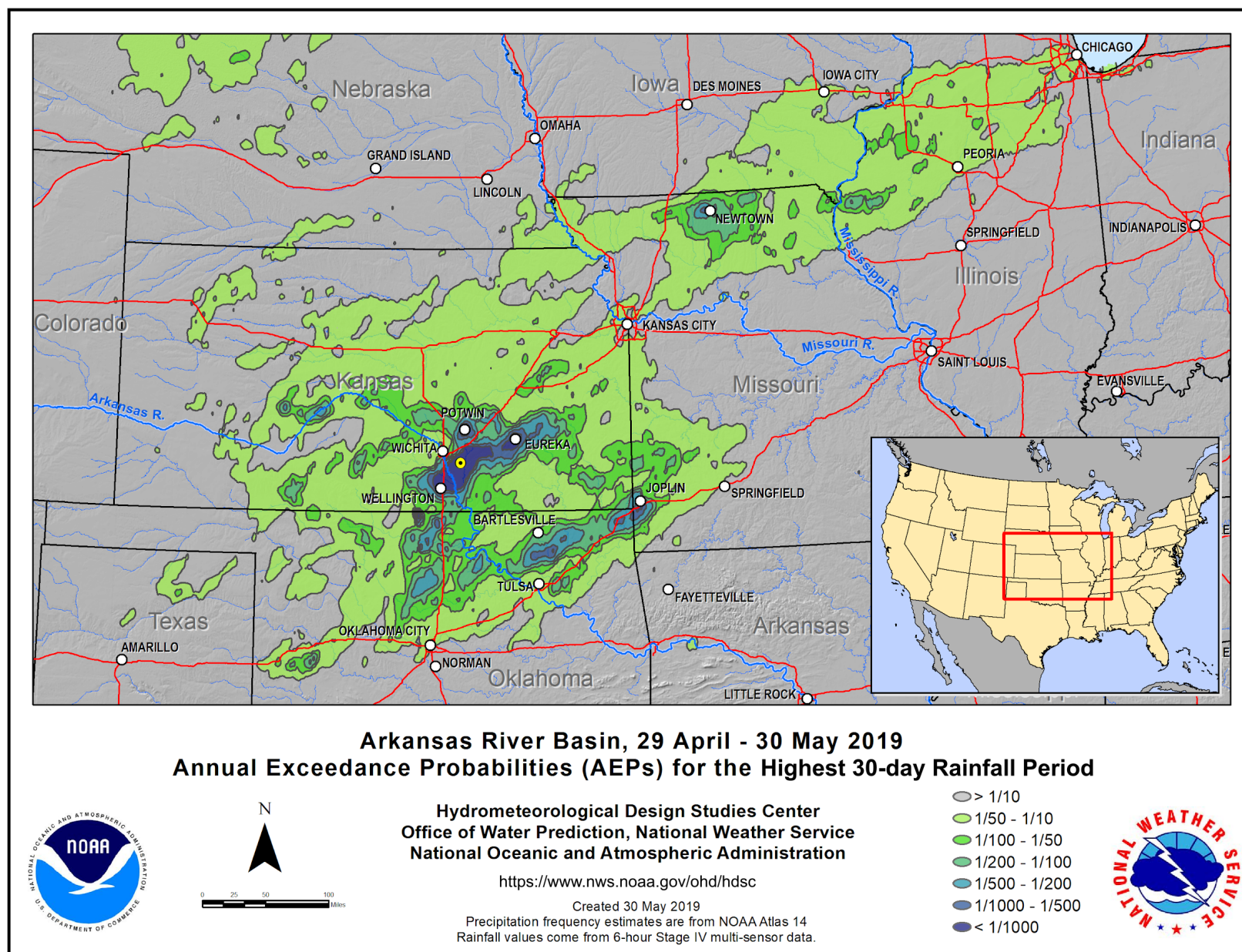


Figure 2. Annual exceedance probabilities for the highest 30-day rainfall at each independent location from 29 April to 30 May 2019. The yellow marker is the location of the US1KSBU0005 CoCoRaHS gauge. [Click here](#) for standalone image.