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Drought-Influenced Low-Flow Non-Exceedance Plots for Selected USGS Gauges in Oklahoma

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Periods of low flow in streams have implications for available water, habitat suitability, and permitted discharges. An important standard in planning for low stream flows is the seven-day average of flows with a 50% probability of occurrence in a year. A 50% probability in a year is equivalent to occurring once in a 2-year period, thus this flow is often labeled the "7Q2" low flow. This project will explore differences between the standard calculation of 7Q2, and estimates that included only flows occurring in low-precipitation years. Understanding the influence of drought on those low flows is important for maintaining Oklahoma's water quality and security in the face of increased climate variability. Exceedance probability plots are useful statistical tools which are used to estimate the annual probability or return interval of a given stream flow. Non-exceedance plots describe the probability that a flow lower than a given magnitude will occur, and are most commonly based on 7-day or 30-day averages from the flow record. When considering climate variability and specifically the likelihood of more frequent droughts, it may be more useful to examine low-flow probabilities based exclusively on flows deemed to have occurred in years with below-average precipitation. The below-average years from the Oklahoma Climatological Survey (OCS) precipitation history for each of the nine climate regions in Oklahoma were used to select only daily average flow records from below average precipitation years, which represent drought-influenced flows. Low-flow plots for 7-day averaged flow for those records were prepared, and the 50% probability flow was compared to the 7Q2 for the full record. The differences between standard and drought-influenced 7Q2 are discussed in the context of Oklahoma climate region and the distribution of normal annual precipitation across the state.