INVESTIGATION OF TRENDS IN BASEFLOW IN NEW JERSEY STREAMS USING DIFFERENT METRICS AND TIMEFRAMES

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ABSTRACT

Annual baseflow in streams across the four physiographic provinces of New Jersey (with streamflow records ranging from 25 to 95 years) was analyzed to identify possible trends. Different timeframes and baseflow metrics were assessed for their utility in identifying trends.

We analyzed three measures of annual baseflow (baseflow per unit drainage area, BF; ratio of BF to precipitation, BF/P; BF fraction of total flow, BF/TF) and the annual minimum daily flow per unit drainage area (AMDF, included as a potential surrogate of baseflow) using the non-parametric Mann Kendall statistical test and the Sen slope estimator. For the 31 unregulated gages, the percentage of gages with significant (95% confidence) increasing trend vs. decreasing trend was 13% vs. 6% for BF, 13% vs. 13% for BF/TF, 16% vs. 23% for BF/P, and 16% vs. 13% for AMDF.

Consistency of the results for the four metrics was investigated by calculating the rate of "disagreement" , i. e., a trend at a specific gage in one metric but not in a different metric, or vice-versa. Disagreement rates between pairs of metrics ranged from 19% to 35%. The sizeable differences among results for the different metrics indicate that each one is unique and are not interchangeable measures of baseflow. Also, these differences cast doubt on AMDF's appropriateness as a surrogate for baseflow.

To determine if there were short-term trends that might have been obscured in the long term records, we examined baseflow at each gage in series of 10-year blocks. For gages without trends in their entire records, only 4% (7 of 203) of the 10-year blocks showed trends. A similar percentage was observed for the gages with entire-record trends: 5% (8 of 160) of the 10-blocks showed trends. That is, trends were infrequently detected in short periods (10 years) regardless of the presence or absence of a long-term trend.

KEYWORDS
Baseflow, trend detection, New Jersey