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From: Julie Zimmerman <julie.zimmerman@TNC.ORG>
Sent: Thursday, August 31, 2017 3:05 PM
To: Ragazzi, Erin@Waterboards; Schultz, Daniel@Waterboards
Cc: Jeanette K. Howard; Daren Carlisle; Larry R Brown; Jason May (jasonmay@usgs.gov); Ted Grantham; Kirk R. Klausmeyer
Subject: Comments on use of unimpaired flows data in draft Cannabis Policy

Dear Erin and Dan,

As authors of the method for estimating natural monthly streamflows for California, we would like to comment on use of the modeled natural streamflows in the Cannabis Policy ("Flow model for estimating natural monthly streamflows in California", pages 48-49 of the Staff Report). As the Staff Report mentions, the natural flows database includes several modeled monthly flow statistics, including maximum, mean, median, minimum, 10th percentile, and 90th percentile of modeled monthly estimates. The method used in the Staff Report to calculate bypass flows (Tessmann Methodology) only uses the estimated mean monthly flow values from the database. Modeled mean monthly flow values are then averaged over the period of record, by month and by year, resulting in one mean monthly flow value for each month (November – April) and year, essentially calculating a long term mean. The Tessmann method then used these long term means to calculate instream flow targets.

As part of the development of the natural monthly streamflow database, we calculated performance metrics for models and estimates of variation of the model predictions. However, model performance was only estimated for the monthly metrics directly modeled by our approach, not the long term means. We recommend that the Board evaluate model performance and/or calculate error bounds around long term means and use the results to inform implementation of the Tessmann approach. In general, we believe it is necessary to evaluate model performance to assess how well the model predicts long term mean monthly and annual flows.

One way this could be accomplished is through an analysis of model performance at reference gages. A set of reference gages with a long period of record (at least 10-20 years) could be used to calculate 6 metrics: observed mean annual flow over the period of record and observed mean monthly flow for November – March over the period of record. The natural flow models should be used to calculate the same metrics over the same period of record at the same gages and the results should be used to calculate observed/expected (O/E) values for each metric. If done for all reference gages with a sufficient period of record, this model performance evaluation could give an estimate of the uncertainty around the modeled flow metrics, either statewide or by region (depending on number of gages per region).

Once the Board calculates error bounds around the long term means, they can be used to inform a decision about whether the Board should be more protective in the implementation of the Tessmann approach by adding a safety factor to the long term mean flow (e.g., decrease the long term monthly mean by a value, such as 10%, to account for uncertainty before calculating allowable diversions), or less protective to err on the side of water availability for diversions (e.g., increase the long term monthly mean by a percentage before calculating allowable diversions). The appropriate use of the model performance analysis is a policy decision that should be informed by the Board's objectives for the Cannabis Policy.

Thank you for the opportunity to provide comments on the use of the natural flows data in the Draft Cannabis Cultivation Policy. We would be happy to meet with you to discuss our comments or answer questions.

Sincerely,
Julie Zimmerman
Jeanette Howard

Daren Carlisle
Ted Grantham
Larry Brown
Kirk Klausmeyer
Jason May

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