

Flow Shapes in the Tuolumne River

Based on “Pulsed Flow Wave Attenuation on a Regulated Montane River” by Dr. Catherine Fong

While rafting, I had the chance to learn the different flow shapes in the Tuolumne River from a mentor, Dr. Catherine “Cat” Fong, who is a hydrologist at Yosemite National Park. Before discussing the flow shapes, it is necessary to understand: what is flow? Flow, or discharge, is the amount, or volume, of water flowing per unit of time in an open channel, in this case a river (Turnipseed and Sauer 1). Meanwhile, pulsed flow refers to artificial flow from a reservoir.

Dr. Cat Fong’s study identified and classified six pulsed flow shapes in the Tuolumne River and modeled the attenuation of representative pulsed flows to test if some of these shapes had lesser impacts on the downstream ecosystem. The study site consisted of a stretch of about 40 kilometers of the mainstem Tuolumne River and 1 kilometer of Cherry Creek between Dion R. Holm Powerhouse and New Don Pedro Reservoir. The flows were generated by Dion R. Holm Powerhouse, which is fed by Cherry Reservoir and Eleanor Reservoir. Flow events were identified from historical discharge data between 1988 to 2012 from a USGS gage located 0.8 kilometers downstream of the tailrace of Dion R. Holm Powerhouse.

The pulsed flows were classified into six shapes, see Figure 1, and they are as follows:

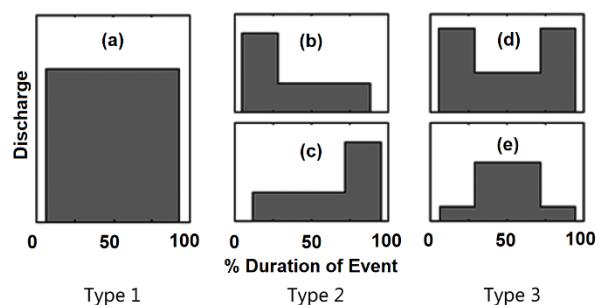


Figure 1. Corresponding Shape Categories.

1. *Rectangle (a)*: This shape was dominant. The interpretation indicated that the pulsed flows peaked at the center of the event. This pulsed flow was considered standard for electricity generation and recreation.
2. *Front-step (b) and Back-step (c)*: The pulsed flows peaked either towards the beginning or end of the event. Front-step flows were concentrated from June to October when recreational flows were released.
3. *Goalpost (d) and Tower (e)*: These types were much less frequent than the other shapes. Tower and Goalpost flows occurred typically in winter.
4. *Other*: Pulsed flow that did not fall into the previous five categories.

Overall, Dr. Fong found: “The Tuolumne River system provides water and electricity to large metropolitan and important agricultural areas, and thus managers and stakeholders will need to balance many conflicting priorities if new environmental flow measures are implemented” (Fong et al.).

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