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Hydroclimate Variability in Snow-fed River Systems: Local Water Managers' Perspectives on Adapting to the New Normal

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Abstract: Between 2012 and 2016, drought characterized by low Sierra Nevada snowpack and anomalously warm temperatures exacerbated water scarcity in the snow-fed Truckee-Carson River System of California and Nevada. However, in winter of 2016/2017, numerous atmospheric rivers made landfall resulting in record precipitation, historic snowpack, and winter and spring flooding. Through interviews conducted annually with key water managers, a collaborative modeling case study underway in this river system examines how local climate adaptation varies coincident with hydroclimate variability. The following research questions are addressed: 1) How does recent hydroclimate variability compare to historical and projected future climate? 2) How do water management challenges during wet years compare to challenges associated with consecutive drought years? 3) How do climate adaptation strategies and barriers change over time? and 4) What science information is necessary to support long-term adaptation? An analysis of interview data collected during the 2015, 2016 and 2017 water years demonstrates that managers continue drought adaptation efforts to enhance water supply and revise management practices based on stationary climate patterns, exemplifying recent conditions as the “new normal” climate for which they should plan. An assessment of recently observed hydroclimate variability reveals recent water years bound historical observations and are consistent with estimated paleoclimate extremes in terms of magnitude, but not persistence, of both dry and wet conditions. To support local adaptation, managers requested researchers simulate alternative water management strategies. This study illustrates how the integration of local knowledge with applied climate research can support adaptive water management in snow-fed river systems.

Keywords: collaborative modelling; hydroclimate variability; snow-fed river systems; climate adaptation