HYDROLOGY/WATERSHEDS VULNERABILITY: FRAMEWORKS FOR FRESHWATER ECOSYSTEM MANAGEMENT IN THE SIERRA NEVADA IN AN ERA OF HYDROCLIMATIC CHANGE.

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<u>Abstract:</u> Freshwater ecosystems of the Sierra Nevada have been maintained by the interplay of biotic and abiotic forces, where hydrological functions bridge aquatic and terrestrial realms. These ecosystems are not only key habitat for fishes, amphibians, birds, and mammals alike, but also provide enumerable benefits to humans. Using coupled simulation modeling, we have been conducting a range wide assessment to assess and synthesize the vulnerability of freshwater ecosystems to hydroclimatic alteration. We have conducted this work within a multi-disciplinary framework, addressing not only physical and ecological science, but also issues of policy, law, and economics. This Integrated modeling effort allows us to characterize and quantify hydroclimatic change in the Sierra Nevada, with a focus on the alteration to the natural flow regime (i.e., magnitude, timing, duration, frequency, rate of change). Not only are riverine and meadow ecosystems vulnerable to this alteration, but other cascading impacts to water supply, hydropower generation, and recreation are also evident. Increasing scrutiny of static (and often arbitrary) approaches to water resource management has shown that changes to policy and law will be necessary to create adaptation solutions that are anticipatory and long-lived, rather than reactionary and episodic. Thus ecosystem management will necessarily need to be embedded within water resource management in an era of hydroclimatic change to reduce vulnerabilities and increase resilience.