

Geologic Subsides Drive High Productivity in Volcanic Spring-Fed Streams

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Critical habitats for cold-water species in lotic ecosystems are anticipated to diminish as global climate change reduces summertime availability of cold water in streams. A hitherto overlooked exception is volcanic spring-fed streams that occur extensively in volcanic terrains throughout the Pacific Ring of Fire. Results of our interdisciplinary study in northern California demonstrate that these streams produce reliably cool summer baseflow and geologically-derived nitrogen and phosphorous to drive exceptional aquatic ecosystem productivity and resiliency, as well as a metabolic advantage for tolerating higher water temperatures. For example, steelhead trout (*Oncorhynchus mykiss*) take advantage of these abundant food resources and stable hydrologic conditions to grow faster and larger (6-fold greater mass) than individuals from an adjacent runoff-dominated river. These spring-fed, nutrient-rich habitats are likely to be exceptionally important for conserving cold-water species impacted by global climate change, and should be considered high value conservation and restoration targets.