Evaporite mineralogy and microbial diversity from alkaline lakes in Warner Valley, Oregon as analogues for paleolakes on Mars

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Warner Valley, Oregon is an alluvial system containing numerous geothermal springs and evaporative lakes underlain and hosted by basaltic flows and deposits from Pleistocene Lake Warner. Springs typically originate from fractures within the Miocene Steens Mountain Basalt, are bicarbonate dominated, and have temperatures ranging from 8.9 to 71.2°C and pH from 6.5 to 8.3. Lakes are relatively dilute in late fall through early spring as much of the water originates from snow melt with a minor geothermal component. Ca^{2+} and Na^{+} are the dominant cations during the colder, wetter months whereas Na^{+} becomes significant during the warmer, evaporative months. Aeolian translocation and chemical precipitation are the dominant mechanisms of mineral sedimentation. Efflorescent salt crusts are common in both the cold and warmer months but their mineralogies are different. Colder months are dominated by hydrohalite and sulfate salt whereas the warmer months also contain carbonate and halite. Water chemistries of the lakes exhibit strong seasonality and range from moderately to highly alkaline to sulfate-chloride and chloride-sulfate dominated with a range in pH from 8.3 to 10.5. Lake waters undergo significant evaporative concentration from late spring through the summer. Within this context, the lakes host a wide variety of chemistries and thermal environments. Algal/bacterial mats (green algae, cyanobacteria, rhodospirillum, and chloroflexus) are segregated by temperature (psychrophiles, mesophiles, thermophiles, and hyperthermophiles) and chemical (alkaliphiles and halophiles) variations of the lakes, playas, and springs.