

A fresh view of microbial life in Yellowstone's hot springs

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The barren areas near the crater of Yellowstone's Imperial Geyser host moderately acidic hot springs, the focus of new research into the temperature and pH ranges of photosynthetic microorganisms. Credit: Yellowstone National Park, Public domain

Yellowstone National Park is home to more than 10,000 hydrothermal features. The park's hot springs, geysers, mud pots, and fumaroles are home to trillions of heat-loving microbes. For photosynthetic biofilms,

the rule of thumb is that algae tend to dominate in acidic springs (pH less than 3), whereas cyanobacteria dominate in alkaline environments (pH greater than 6). However, this generalization is rooted in 50-year-old research, and most studies have overlooked the intermediate pH values between the extremes.

In a new study, Fecteau et al. evaluated microbial habitat ranges in hydrothermal springs based on temperature and pH. Looking at moderately acidic springs (pH 3–6), they sampled for cyanobacteria and [algae](#) at 12 sites in Yellowstone's Midway Geyser Basin and Lower Geyser Basin.

To determine the composition of the springs' microorganisms, the researchers sequenced genes and analyzed pigments extracted from biofilm samples. The gene sequencing revealed microbes from the cyanobacteria genus *Chlorogloeopsis* and the algal genus *Cyanidioschyzon*. Cyanobacteria and algae coexisted in 10 of the 12 sampled [hot springs](#), with cyanobacteria outnumbering algae by 1–7 orders of magnitude.

The results suggest that cyanobacteria and algae can be found together in moderately acidic hydrothermal features. However, the algae appeared to be inactive in most of the springs. This finding may reflect seasonality in the pools, according to the authors, because the testing happened in the summer. Seasonal temperature and pH swings that likely occur in moderately acidic hot springs, which are sourced largely by rain and snowmelt, can affect microbial activity and habitability.

Although the results depict only a snapshot of hot spring conditions during the summer, the study offers a fresh perspective on [microbial life](#) in Yellowstone's hydrothermal springs.

More information: Kristopher M. Fecteau et al, Cyanobacteria and

Algae Meet at the Limits of Their Habitat Ranges in Moderately Acidic Hot Springs, *Journal of Geophysical Research: Biogeosciences* (2021).
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