

SCIENCE OF THE SPRINGS:

Astrobiology in Yellowstone National Park – Booklet

OVERVIEW

This worksheet and activity accompany the *Science of the Springs* booklet about astrobiology and Yellowstone. The first part includes questions that the students can answer by reading the text. Following are activities that expand on the topic. Additional readings about astrobiology help students learn more about extremophiles.

AGE RANGE

Grades 5-12

TIME REQUIRED

45 min to 1 hour

LEARNING OBJECTIVES

- Students will describe the conditions at Yellowstone that make it an extreme place for organisms to live.
- Students will understand the connection between Yellowstone and astrobiology.
- Students will understand the importance of extremophiles to the search for life on other planets.

BACKGROUND KNOWLEDGE

Students will need to know a little bit about microbes and pH for the reading. They will also need some knowledge of geysers and thermal features.

INTRODUCTION

- **Ask your students** what they know about astrobiology. If they don't know what it is, explain the parts of the word (**astro**: space, and **biology**: life). Astrobiology is about life (or aliens) in space. Astrobiologists (scientists who study astrobiology) ask questions like, "Is there life on other planets?" "How could life originate?" and "What is the future of life on Earth?"
- **Ask students** if they have ever been to Yellowstone National Park. What kinds of organisms did they see there? Lead the discussion of Yellowstone National Park to the thermal features. Did they know there are things living in these features? That is what causes the pretty colors. You may need to discuss pH in the context of thermal features. This can be very basic but is necessary for understanding much of the booklet and activity. Tell the students that we are going to learn about why NASA researchers are studying Yellowstone.
- As an alternative to the informal discussions, you may show the students the Powerpoint available with the reading guide. This would be a good introduction.



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READING

Students can either read the booklet independently and fill out the worksheet as they are reading, or you can read the booklet to the whole class and discuss the questions as a group.

The questions in the reading guide may be difficult for students to answer without a booklet in front of them. The geyser activity also requires information directly from the booklet.

(You may print out the booklets from the PDF downloadable via <http://eu.montana.edu/outreach/resources/> or contact MSU's Extended University at ExtendedU@montana.edu to request copies.)

ACTIVITIES

The rest of the reading guide can be used on its own or directly following the reading of the *Science of the Springs* booklet. The activity that follows “learn more about extremophiles” relates directly to that reading.

EXTENSIONS

This reading and activity can be used in conjunction with other astrobiology learning activities available at <http://eu.montana.edu/outreach/resources/>