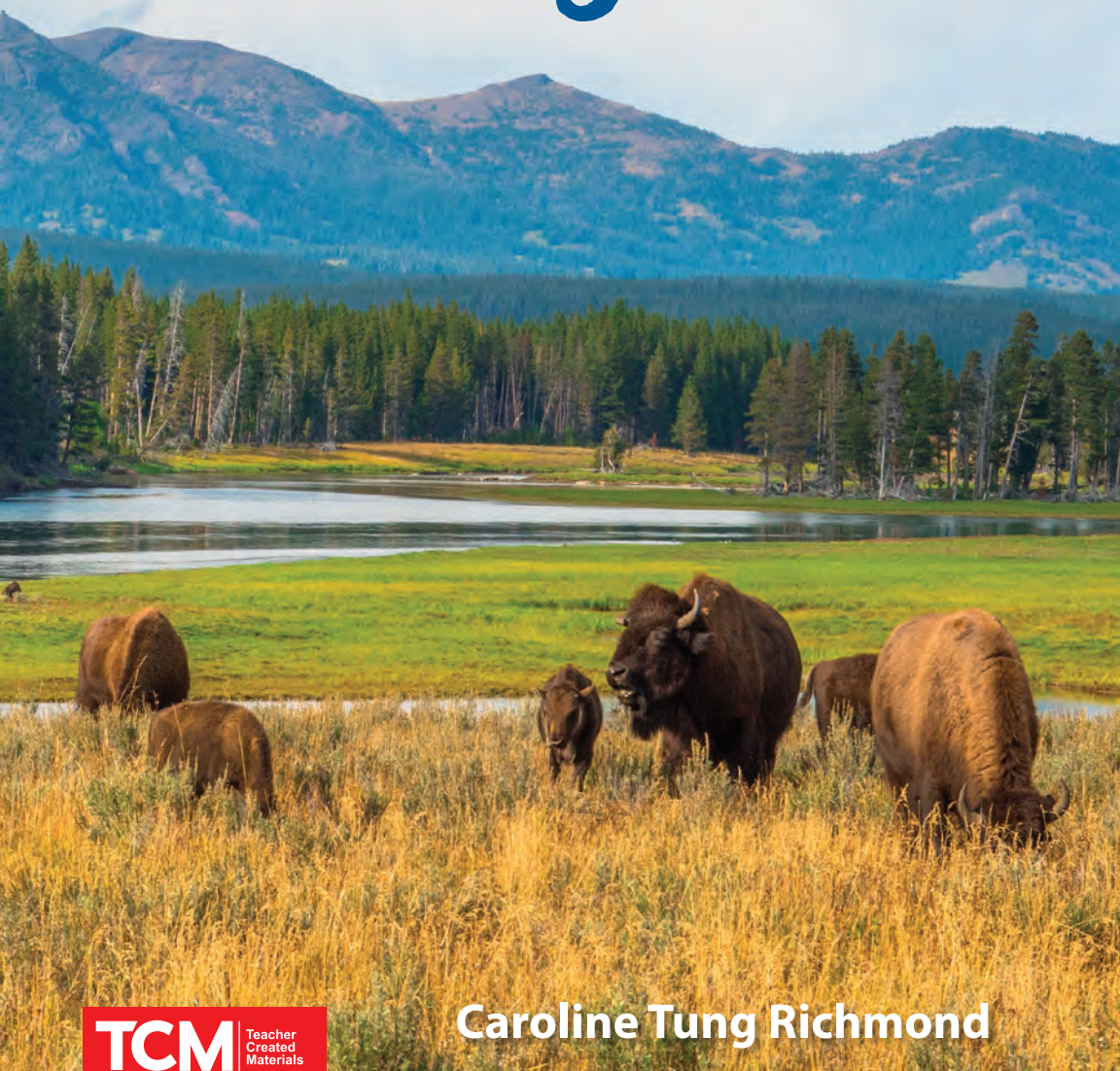




Smithsonian

Yellowstone's Ecosystem



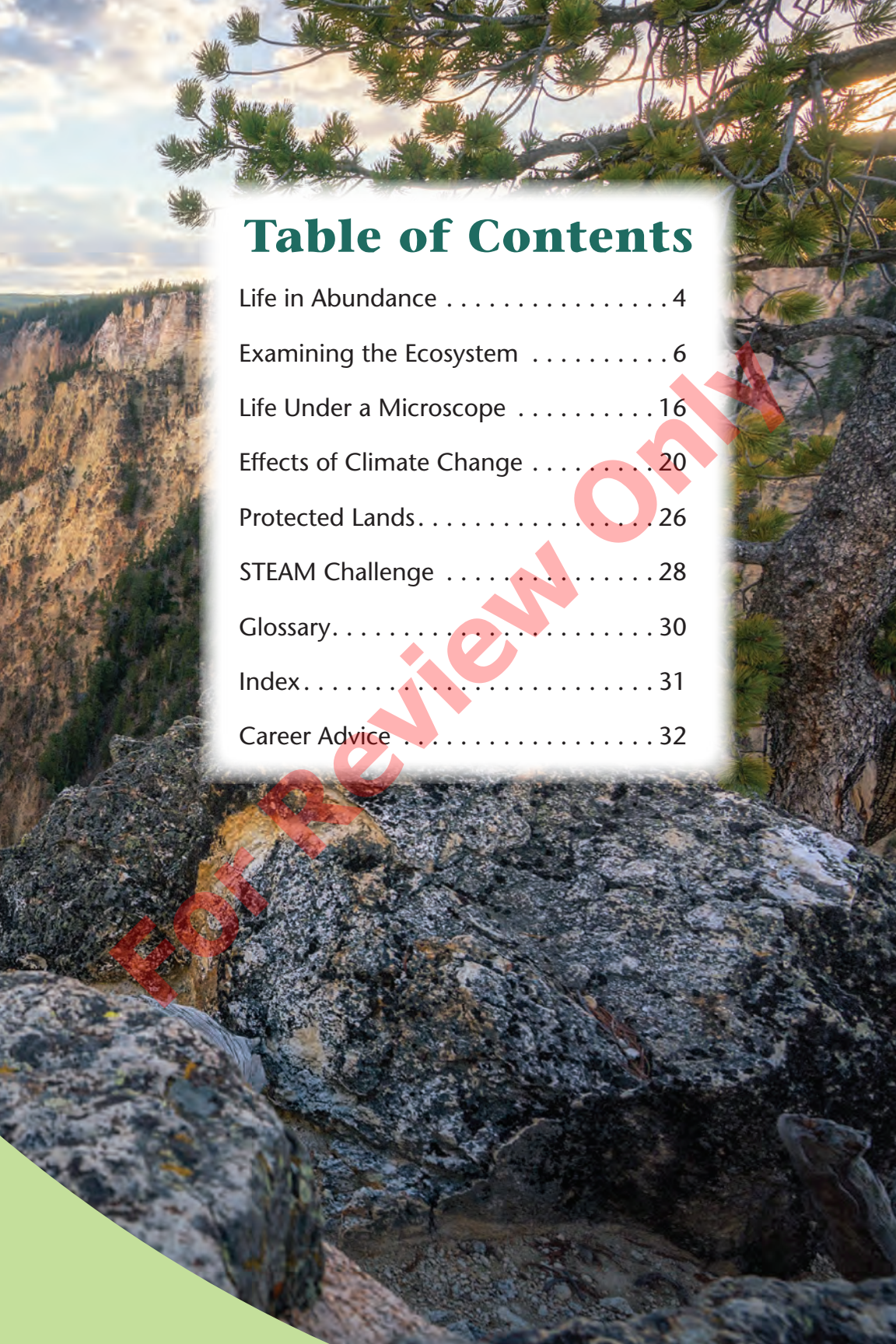


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Life in Abundance

An elk grazes in the mountains, its ears pricked for the sounds of an approaching gray wolf. To the east, a herd of bison grazes in a sunny meadow. A single deer laps water from a stream as an eagle swoops down from the sky, snatching a marmot in its claws. It soars through the air, flying back to its nest of hungry eaglets. And to the south, a colorful hot spring bubbles with near-boiling water. Surprisingly, life can exist even in extreme temperatures. Tiny creatures known as **thermophiles** call hot springs and **geysers** home.



Yellowstone National Park is one of the most popular national parks in the United States, and it's not hard to see why. This amazing wildlife and more can be found there. And the park's figure-eight-shaped road takes visitors past many astonishing sights. These include tall waterfalls, wide-open meadows, and ancient rock formations.

Yellowstone is part of one of the most unique **ecosystems** in the world. This is all thanks to the thousands of plant and animal species that flourish across the land. Life thrives there, but death has a role, too. Learning about the ecosystem, thermal features, and the effects of **climate change** at the park unlocks a unique view into this special part of the United States.

FUN FACT

Yellowstone stretches across parts of Wyoming, Montana, and Idaho. It became the first national park in the United States in 1872. It was created when lawmakers in Congress passed a law to protect and preserve the land.



Examining the Ecosystem



Yellowstone National Park is part of one of the biggest ecosystems on Earth. It is at the heart of the Greater Yellowstone Ecosystem. This area covers a large amount of land in Wyoming, Montana, and Idaho. Yellowstone's boundaries mark just a small part of this greater ecosystem. But the park's unique protections provide an important space for wildlife and plants. Here, scientists have countless opportunities to study how life thrives.

Yellowstone's ecosystem includes all the animals, plants, and **microbes** that live there. It also includes the nonliving things in the park. Soil, rocks, and bodies of water are part of the ecosystem, too. Ultimately, the living and nonliving parts of Yellowstone's ecosystem are linked together. They are connected through cycles of energy and nutrients.

Painting the Park

In 1871, a painter named Thomas Moran set out on a 40-day journey. He traveled in the Wyoming Territory and painted what he saw. In the end, he had numerous paintings of the area's geysers, lakes, and mountains. His artwork helped convince lawmakers to create Yellowstone National Park.

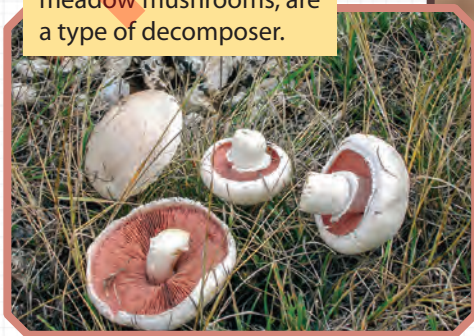


All plants and animals in an ecosystem need energy to live. These living things can be sorted into three groups: producers, consumers, and decomposers. The way that energy flows through these three groups can make up a **food chain**. Each group plays a specific role in Yellowstone's ecosystem. Producers, such as plants, use energy from the sun to make their own food. Consumers eat these plants and other animals. Decomposers break down dead plants and animals. Their nutrients go into the soil, where new plants can sprout. All together, these groups bring balance to the park's ecosystem.

Plants like this lodgepole pine tree are producers.



Fungi, including these meadow mushrooms, are a type of decomposer.



Grizzly bears are consumers.

Producers: The Chefs

Producers are at the first level of every food chain. At Yellowstone, they include grasses, shrubs, and trees. Producers are a bit like chefs: they make their own food. They take energy from the sun and use it to create food through **photosynthesis**. This process sustains them throughout their lives. Eventually, they become food for consumers and decomposers. Producers form the backbone of the park's ecosystem, passing their energy up a food chain.

In Yellowstone's forests, producers include trees that cover 80 percent of the land. Willow and fir trees nourish moose who love to munch on leaves. Seeds from conifer trees sustain red squirrels as they scurry through the woods. And during the winter, tree bark can help snowshoe hares survive the coldest months.



Birds, foxes, and raccoons like to eat Oregon grape plants that grow along Yellowstone Lake.



Moose eat 18–27 kilograms (40–60 pounds) of plant material a day!

Yellowstone has many wetlands throughout the park.



Yellowstone's rivers and lakes contain many aquatic plants and algae. These producers feed all sorts of animals, from the tiniest tadpoles to 318-kilogram (700-pound) elk. Algae is a common food for flies and trout. In ponds, water lilies are both pretty and practical. Beavers eat them when land-based plants are scarce.

Grasses and **sedges** are key producers in Yellowstone's valleys. Bison **migrate** across the park to nibble on these sprouting plants. Elk and bighorn sheep also rely heavily on grasses for their meals. Small mammals, such as voles and marmots, get their nutrients from grasses, too.



STEAM CHALLENGE

Define the Problem

Yellowstone National Park is full of life, and scientists are intrigued with the abundance of interactions within the ecosystem. They are always thinking of new research questions, and they continue to observe plants and animals in the park. Your task is to design and build a tool that scientists can use to study and make observations about plants or animals at Yellowstone. Your tool can either be something that scientists wear or use to help them do their work.



Constraints: You may use only the materials provided to you.



Criteria: You must be able to wear the tool you created or demonstrate how it is used. It must include at least two key features for observation, and you must be able to explain how it will be useful to scientists.



CAREER ADVICE

from Smithsonian

Do you want to study ecosystems?

**Here are some tips to
keep in mind for the future.**

"Every living thing can be a teacher; to be students takes curiosity and a willingness to learn. Take classes in STEAM that interest you and remember that the world is your classroom, too. Practice embracing your curiosity and close-looking at the environment around you, wherever you are. Patience, observation, and dedication are key."

– *Alia Payne, Ocean Education Specialist,
Smithsonian National Museum of Natural History*

"Scientists will make many observations while learning about the environment that they are studying. There is no better place to get this practice than to make observations in your local environment! Take the time to explore the forests, streams, lakes, coastlines, deserts, or mountains that are around you and make close observations of nature. Even if it is your own backyard, you will be surprised how many things you will see in a small area when you look closely. There was always something that surprised me in my local area when I was growing up."

– *Bayley McKeon, Ocean Education Specialist,
Smithsonian National Museum of Natural History*

Read and Respond

1. What is an ecosystem?
2. Choose two animals, and describe how they coexist in Yellowstone.
3. What are the differences among producers, consumers, and decomposers?
4. Describe the three types of thermophiles that live in Yellowstone.
5. What can happen to an ecosystem if an animal or plant species dies off?
6. What might happen to Yellowstone if the effects of climate change are not addressed?

