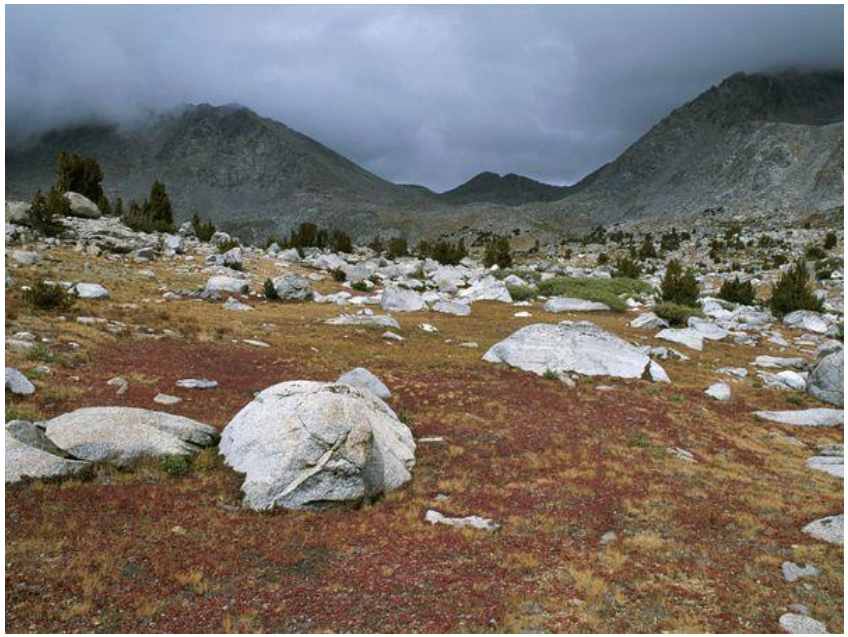
# Tundra

Dry, Cold, and Windy

Photo: Tundra in fall colors with the high Sierra surrounded by clouds/ Photograph by Rich Reid



Tundras are among Earth's coldest, harshest biomes. Tundra ecosystems are treeless regions found in the Arctic and on the tops of mountains, where the climate is cold and windy and rainfall is scant. Tundra lands are snow-covered for much of the year, until summer brings a burst of wildflowers.

Mountain goats, sheep, marmots, and birds live in mountain, or alpine, tundra and feed on the low-lying plants and insects. Hardy flora like cushion plants survive on these mountain plains by growing in rock depressions where it is warmer and they are sheltered from the wind.

The Arctic tundra, where the average temperature is 10 to 20 degrees Fahrenheit (-12 to -6 degrees Celsius), supports a variety of animal species, including Arctic foxes, polar bears, gray wolves, caribou, snow geese and musk-oxen. The summer growing season is just 50 to 60 days, when the sun shines 24 hours a day.

The few plants and animals that live in the harsh conditions of the tundra are essentially clinging to life. They are highly vulnerable to environmental stresses like reduced snow cover and warmer temperatures brought on by global warming.

The Arctic tundra is changing dramatically due to global warming. Already, more southern animals like the red fox have moved onto the tundra. The red fox is now competing with the Arctic fox for food and territory, and the long-term impact on the sensitive Arctic fox is unknown.

It is the Arctic's permafrost that is the foundation for much of the region's unique ecosystem, and it is the permafrost that is deteriorating with the warmer global climate. Permafrost is a layer of frozen soil and dead plants that extends some 1,476 feet (450 meters) under the surface. In much of the Arctic it is frozen year round. In the southern regions of the Arctic, the surface layer above the permafrost melts during the summer and this forms bogs and shallow lakes that invite an explosion of animal life. Insects swarm around the bogs, and millions of migrating birds come to feed on them.

# Desert

Arid, But Full of Life

Photo: Desert landscape/ Photograph by Stephen Sharnoff and Sylvia Duran

Far from being barren wastelands, deserts are biologically rich habitats with a vast array of animals and plants that have adapted to the harsh conditions there. Some deserts are among the planet's last remaining areas of total wilderness.

Deserts cover more than one fifth of the Earth's land, and they are found on every continent. A place that receives less than 10 inches (25 cm) of rain per year is considered a desert. Deserts are part of a wider classification of regions called "drylands." These areas exist under a moisture deficit, which means they can frequently lose more moisture through evaporation than they receive from annual precipitation.

And despite the common conceptions of deserts as dry and hot, there are cold deserts as well. The largest hot desert in the world, northern Africa's Sahara, reaches temperatures of up to 122 degrees Fahrenheit (50 degrees Celsius) during the day. But some deserts are always cold, like the Gobi desert in Asia and the desert on the continent of Antarctica. Others are mountainous. Only about 10 percent of deserts are covered by sand dunes. The driest deserts get less than half an inch (1 cm) of precipitation each year, and that is from condensed fog not rain.

Desert animals have adapted ways to help them keep cool and use less water. Camels, for example, can go for days without food and water. Many desert animals are nocturnal, coming out only when the brutal sun has descended to hunt. Some animals, like the desert tortoise in the southwestern United States, spend much of their time underground. Most desert birds are nomadic, crisscrossing the skies in search of food. Because of their very special adaptations, desert animals are extremely vulnerable to introduced predators and changes to their habitat.

Desert plants may have to go without fresh water for years at a time. Some plants have adapted to the arid climate by growing long roots that tap water from deep underground. Other plants, such as cacti, have special means of storing and conserving water. Many desert plants can live to be hundreds of years old.