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Paper:GEO-GE-O3-TH- Environmental Geography

Topic: Desert Biomes

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Introduction:

- The word "desert" comes from a Latin word meaning "abandoned." How appropriate, because when people think about deserts, they mostly conjure up images of endless sand dunes and desolate stretches of barren land. These images are accurate in some places in the world, but there are different types of deserts. Principally, what makes a desert is an inherent lack of regular rainfall, but scientists use a variety of additional factors to classify deserts into categories (hot and dry, semiarid, coastal, and cold).
- These factors include temperature, humidity, geology, soil and mineral composition, and the flora and fauna that inhabit the region. Desert biomes are incredibly interesting to look at. They cover about 20% of the Earth and occur where rainfall is less than 50 cm/year. There are mainly four types of deserts in this biome – hot and dry, semiarid, coastal, and cold. These ecosystems are identified by the fact that they don't get a lot of precipitation during the year. Only those plants and animals that are able to adapt to the climate and temperature of desert can survive there. Deserts that receive rain as the main form of precipitation are called as hot deserts while those which receive snow as their main form of precipitation are called as cold deserts. Here are some quick and interesting facts about desert biomes.
- Although most deserts, such as the Sahara of North Africa and the deserts of the southwestern U.S., Mexico, and Australia, occur at low latitudes, another kind of desert, cold deserts, occur in the basin and range area of Utah and Nevada and in parts of western Asia. Most deserts have a considerable amount of specialized vegetation, as well as specialized vertebrate and invertebrate animals. Soils often have abundant nutrients because they need only water to become very productive and have little or no organic matter. Disturbances are common in the form of occasional fires or cold weather, and sudden, infrequent, but intense rains that cause flooding.

Why are Deserts so Hot?

- In most places around the world, moisture in the air prevents the sun's rays from completely penetrating the atmosphere, allowing a 'moisture blanket' to protect the Earth from the sun's intense heat. But in deserts, humidity is low, and the moisture content in the air is minimal, so the sun's rays are able to penetrate the Earth, creating dangerously high temperatures.
- This lack of humidity also accounts for deserts' extreme temperature differences. Since moisture in the air is low, heat accumulated during the daylight hours dissipates quickly, causing temperatures to plummet once the sun goes down.

Major Types of Desert Biomes:

As mentioned above, there are four major types of desert biomes. They are as follows ,

1. Hot and Dry Desert:

- There are multiple hot and dry deserts all over the world; four in North America (Chihuahuan, Sonoran, Mojave and Great Basin), and various others located throughout the world.
- Summers are unbearably hot; temperatures are warm throughout the rest of the year.
- There is little to no rainfall during the summer months in a hot and dry desert climate.
- Winters come and there is very little precipitation at all, but that is usually when it occurs.

- Average temperature during the day is 23 degrees Celsius; it can get as hot as 49 degrees Celsius.
- Plant life is rare in hot and dry deserts; mostly small trees and shrubs. Canopy in most deserts is very rare. Plants are mainly ground-hugging shrubs and short woody trees. Leaves are "replete" (fully supported with nutrients) with water-conserving characteristics. They tend to be small, thick and covered with a thick cuticle (outer layer). In the cacti, the leaves are much-reduced (to spines) and photosynthetic activity is restricted to the stems. Some plants open their stomata (microscopic openings in the epidermis of leaves that allow for gas exchange) only at night when evaporation rates are lowest. These plants include: yuccas, ocotillo, turpentine bush, prickly pears, false mesquite, sotol, ephedras, agaves and brittlebush.
- The animals include small nocturnal (active at night) carnivores. The dominant animals are burrowers and kangaroo rats. There are also insects, arachnids, reptiles and birds. The animals stay inactive in protected hideaways during the hot day and come out to forage at dusk, dawn or at night, when the desert is cooler.

- Animals of all types live throughout the region (insects, mammals, arachnids, birds, reptiles).

- Carnivorous animals are common due to the lack of plant life in the hot and dry desert. They mostly stay inactive in protected hideaways during day when it is too hot and come out at night when it is a little cooler.

- Soil is very rocky, coarse, and/or filled with gravel. Because of this, water drains incredibly well and won't stick around below the surface.

From left: Baja, Mexico desert; desert in Uluru National Park, Australia; desert near the Kofa Mountains, Arizona

2. Semiarid Desert

- Semiarid deserts are those that we think of in the north-western part of the United States. There are others located throughout North America, Northern Europe, and Northern Asia. The major types of semiarid desert include the sagebrush of Utah, Montana and Great Basin.

- Semiarid deserts are only located in the Northern hemisphere due to their unique setup and the temperatures that they maintain throughout the year.

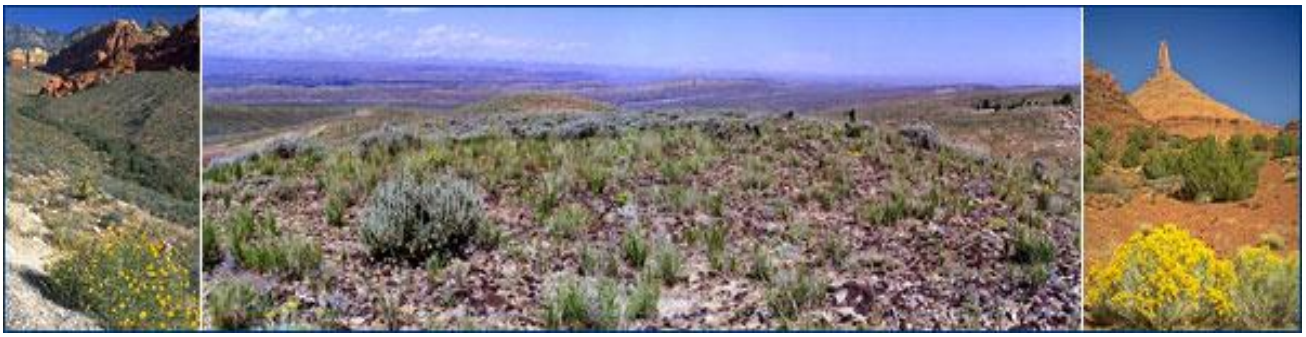
- Summer temperatures average about 23 degrees Celsius, but it never gets warmer than 38 degrees Celsius (much cooler than hot and dry deserts). In the evening, the temperatures are cool, at around 10° C.

- There is little to no rainfall during the summer months, with spots of precipitation during the winter. The annual rainfall ranges from 2-4 cm annually.

- Soil is shallow, sandy, and fine, especially when compared with the hot and dry deserts that we discussed above.

- Plants in semiarid areas often taste badly and have spikes or hairs that make them difficult to touch or even go near. This is to prevent animals and people from going near them and causing them to lose their grip (their roots are too shallow to have a solid grip).

- Mammals, small birds, reptiles, and insects reside in the area. Animals are both diurnal and nocturnal, and use the shade of the plants to be able to function during the daylight hours.



From left: Red Rock Canyon National Conservation Area, southern Nevada; sagebrush near Bridger, Montana; Castle Valley, Utah, east of Arches National Park.

3. Coastal Desert

- Coastal deserts are one of the most unique deserts that you will find when you're looking. These deserts can be found in cools to warm areas such as the Nearctic and Neotropical realm. They aren't very common; the most well-known is the Atacama, which is located in South America.

- Summers are warm, with temperatures rarely going above 20 degrees Celsius. The mean temperature in summers ranges from 13-24° C.

- Winters are cool, with temperatures between -3 and 6 degrees Celsius; on occasion, it will dip down to -4 or -5 (C).

- Coastal deserts get more rain than their semiarid and hot and dry cousins; they can get up to 12 or more centimetres every single year.

- Like semi-arid deserts, the coastal desert ends up being incredibly fine.

- The soil is fine-textured with a moderate salt content. It is fairly porous with good drainage. Some plants have extensive root systems close to the surface where they can take advantage of any rain showers. All of the plants with thick and fleshy leaves or stems can take in large quantities of water when it is available and store it for future use. In some plants, the surfaces are corrugated with longitudinal ridges and grooves. When water is available, the stem swells so that the grooves are shallow and the ridges far apart. As the water is used, the stem shrinks so that the grooves are deep and ridges close together. The plants living in this type of desert include the salt bush, buckwheat bush, black bush, rice grass, little leaf horse brush, black sage, and chrysothamnus.

- Some animals have specialized adaptations for dealing with the desert heat and lack of water. Some toads seal themselves in burrows with gelatinous secretions and remain inactive for eight or nine months until a heavy rain occurs. Amphibians that pass through larval stages have accelerated life cycles, which improves their chances of reaching maturity before the waters evaporate. Some insects lay eggs that remain dormant until the environmental conditions are suitable for hatching. The fairy shrimps also lay dormant eggs. Other animals include: insects, mammals (coyote and badger), amphibians (toads), birds (great horned owl, golden eagle and the bald eagle), and reptiles (lizards and snakes).

4. Cold Desert

- Cold deserts are also incredibly unique when compared to all of the other types of deserts that we've looked at here. They occur in the Antarctic, Greenland and the Nearctic realm. The mean temperature in summers ranges from 21 to 26 ° C and mean winter temperature is between -2 to 4° C. The cold deserts are known to receive snow during the winter and high overall rainfall throughout the winter that averages out to 15 – 26 cm a year. Here are a few quick facts to give you a better idea as to what cold deserts are like.

- Cold deserts have incredibly cold winters, which can get anywhere from -2 to 4 degrees Celsius.

- Contrary to their name, cold deserts still have summers, with temperatures rarely going above 20 degrees Celsius.

- Snowfall is immense, especially when compared with the other types of deserts which get next to no rainfall. The average is usually around 15 to 20 centimetres of precipitation throughout the winter months.

- The most precipitation ever recorded in a cold desert in a year was over 45 centimetres, which is what some other types of deserts get over several years' time.

- Because of the landscape, the soil is incredibly heavy and has lots of pores so that it can take in every bit of water that it can.

- The heaviest precipitation is either in the late spring or the early fall, depending on where the cold desert is located.
- Plants are not common in the cold desert, but the ones that are there are spiny deciduous plants, along with some mosses and fungi. The plants are widely scattered. In areas of shadscale, about 10 percent of the ground is covered, but in some areas of sagebrush it approaches 85 percent. Plant heights vary between 15 cm and 122 cm. The main plants are deciduous, most having spiny leaves.
- Widely distributed animals are jack rabbits, kangaroo rats, kangaroo mice, pocket mice, grasshopper mice, and antelope ground squirrels. In areas like Utah, population density of these animals can range from 14-41 individuals per hectare. All except the jack rabbits are burrowers. The burrowing habit also applies to carnivores like the badger, kit fox, and coyote.

- Animals that reside in the cold desert are mostly mammals, due to the fact that the winters get cold. Other animals would likely die if they tried to live there. Many of these mammals are burrowers who live underground and hibernate for at least part of the winter months.

- If there are lizards (which happens in some of the relatively warmer cold deserts), they are burrowers that end up hibernating when the cold months of winter come around.

Lichen growing on Torgerson Island, Antarctica; kangaroo rat.