

Subject: Basic Ecology (ZOL-502)
(BS Zoology 6th Semester)

Terrestrial Ecosystems
(Desert Ecosystem)

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Desert Ecosystem:

- **What is a Desert Ecosystem?**
- A desert ecosystem is a terrestrial ecosystem characterized by extremely low rainfall, making it one of the driest environments on Earth. Despite harsh conditions, deserts support uniquely adapted plant and animal life.
- **Key Feature:**
- Annual precipitation is less than 25 cm (10 inches) on average.

Types of Deserts

- Deserts can be classified based on climate into hot and cold deserts:
-  **A. Hot Deserts**
- **Location:**
- Sahara (Africa), Thar (India, Pakistan), Arabian (Middle East), Sonoran (USA)
- **Climate:** Extremely hot during the day, cold at night
- **Temperature:** Up to 50°C or higher in summer
- **Vegetation:** Sparse, mainly succulents like cacti and drought-resistant shrubs

Types of Deserts

-  **B. Cold Deserts**
- **Location:** Gobi (Mongolia/ China), Great Basin (USA), Antarctic Desert
- **Climate:** Very cold winters and mild to cool summers
- **Temperature:** Below freezing in winter
- **Precipitation:** Mainly snow
- **Vegetation:** Sparse grasses, mosses, and lichens



Characteristics of Desert Ecosystems

Feature	Description
Rainfall	Very low (less than 25 cm/year)
Temperature	Extreme (very hot or very cold)
Soil	Sandy or rocky, low in organic matter
Humidity	Very low
Biodiversity	Low but highly specialized and adapted

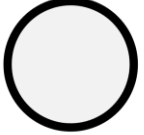
Structure of a Desert Ecosystem

- **Biotic Components (Living)**
- **i. Producers**
- Plants adapted to conserve water:
- Cactus, acacia, euphorbia, creosote bush
- Some grasses and drought-resistant herbs
- Perform photosynthesis with adaptations (e.g., CAM pathway)
- **ii. Consumers**
- Primary consumers (Herbivores):
- Insects, rodents, camels, antelope

Structure of a Desert Ecosystem

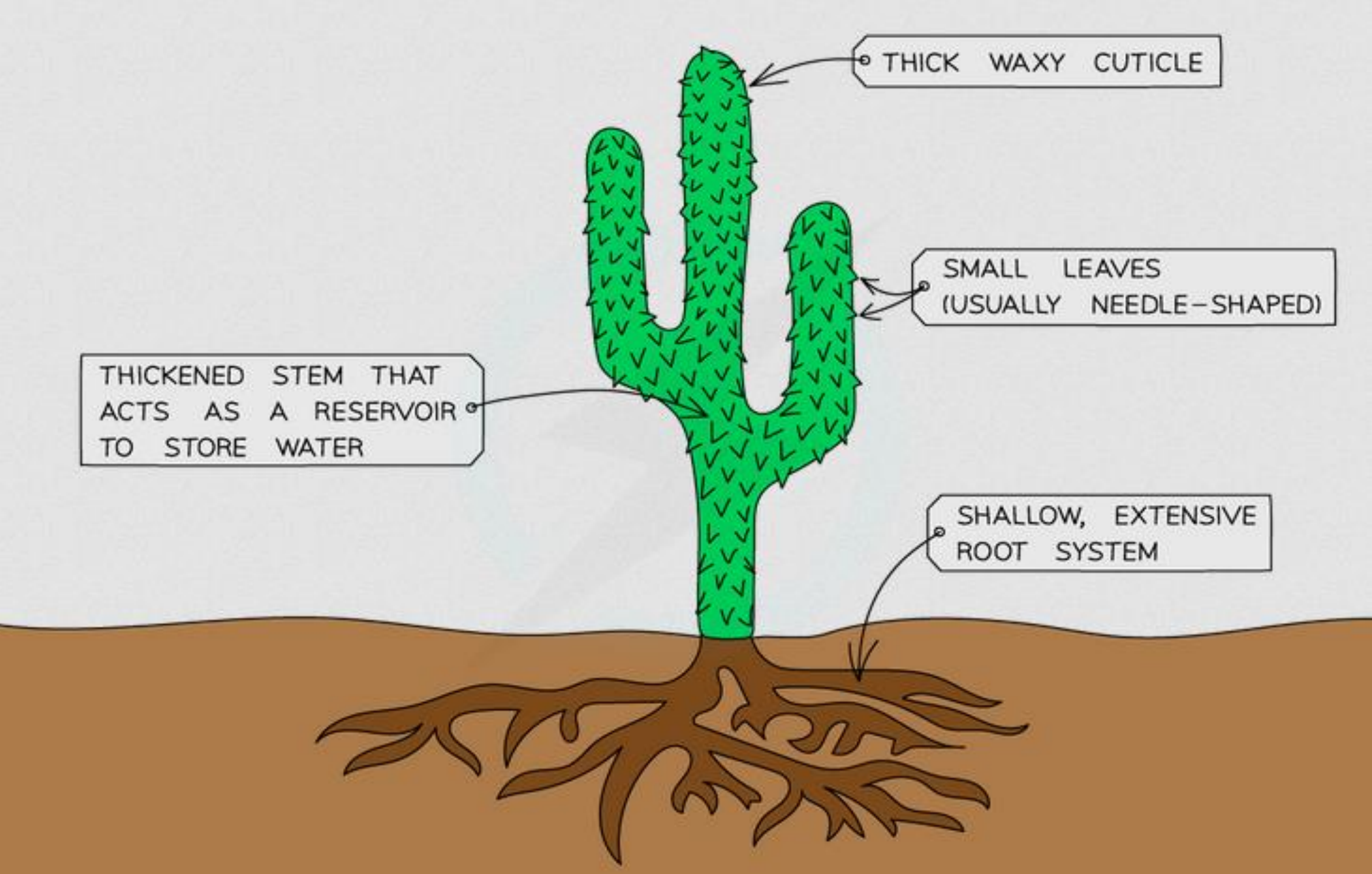
- Secondary consumers (Carnivores):
- Lizards, snakes, foxes, birds of prey
- Tertiary consumers (Top predators):
- Desert cats, hawks, owls
- **iii. Decomposers**
- Fungi, bacteria, and insects
- Break down organic material, though decomposition is slower due to dryness

Structure of a Desert Ecosystem

-  **Abiotic Components (Non-living)**
- **Climate:** Intense sunlight, low humidity, variable temperatures
- **Soil:** Dry, often saline, low in nutrients
- **Sand and rocks:** Dominant physical features
- **Wind:** Plays a major role in erosion and shaping landforms

Plant and Animal Adaptations in Deserts

- Desert organisms have evolved specialized adaptations to survive in harsh conditions.
-  **Plant Adaptations**
- Thick, waxy cuticles to reduce water loss
- Spines instead of leaves (e.g., cactus) to minimize evaporation
- Deep tap roots or wide shallow roots to access water
- Water storage tissues (succulents)



THICK WAXY CUTICLE

The diagram shows a green cactus with three arms, covered in small, dark, V-shaped spines. The cactus is rooted in a brown soil layer. Four labels with arrows point to specific features: the top arm for the thick waxy cuticle, the spines for small needle-shaped leaves, the main stem for its water-storing function, and the root system for its shallow and extensive nature.

SMALL LEAVES
(USUALLY NEEDLE-SHAPED)

THICKENED STEM THAT
ACTS AS A RESERVOIR
TO STORE WATER

SHALLOW, EXTENSIVE
ROOT SYSTEM

Succulent Xerophytes with Fleshy Leaves



Aloe



Agave



Haworthia



Bryophyllum



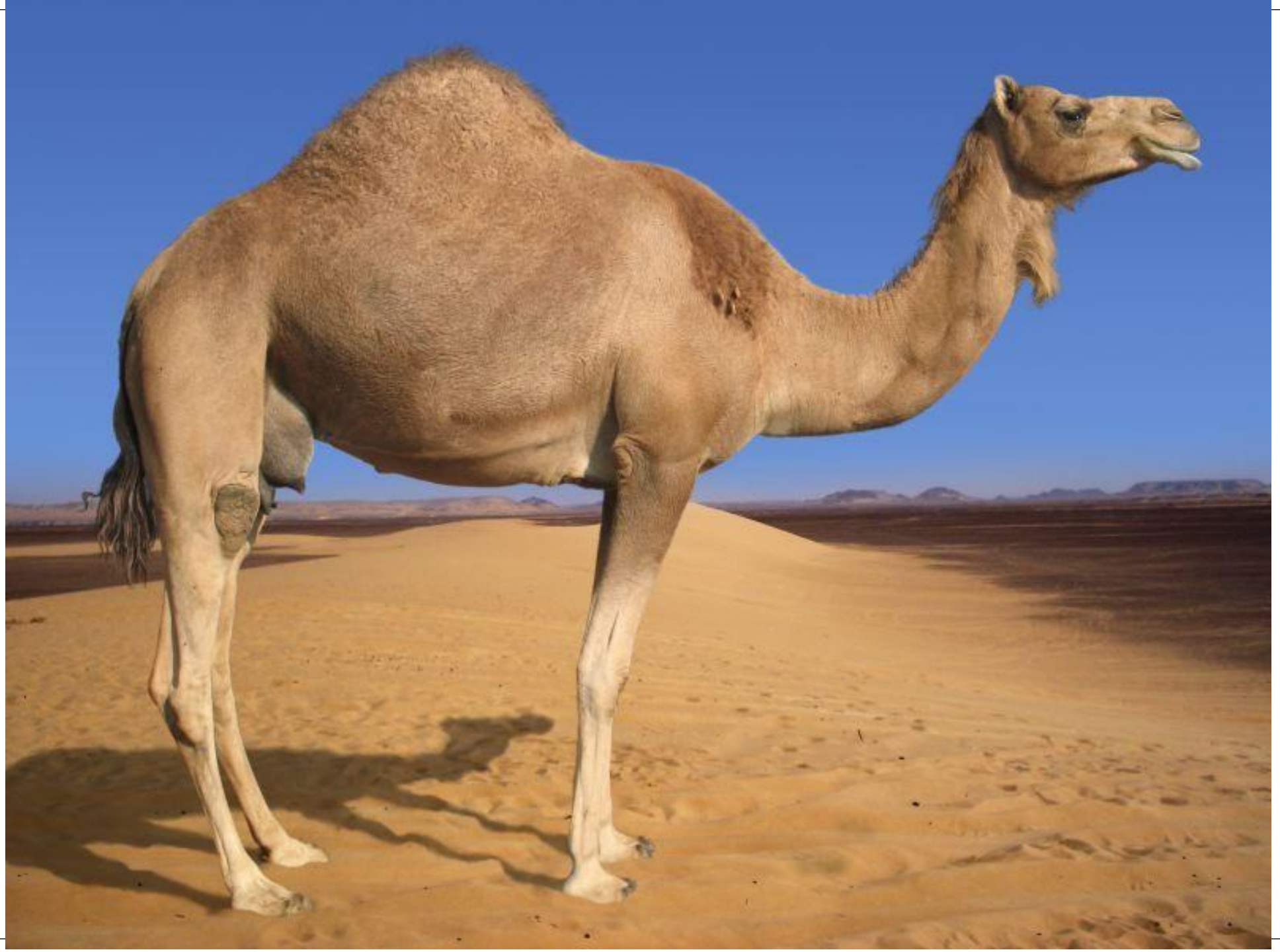
Peperomia



Kalanchoe

Plant and Animal Adaptations in Deserts

-  **Animal Adaptations**
- Nocturnal behavior to avoid daytime heat
- Efficient water retention (e.g., concentrated urine, dry feces)
- Light-colored body to reflect sunlight
- Burrowing habits to stay cool underground
- Humps in camels to store fat (not water, contrary to myth)



Functions and Importance of Desert Ecosystems

-  **Ecological Importance**
- Habitat for unique biodiversity
- Soil formation and weathering of rocks
- Some carbon storage by desert plants
- Pollination and seed dispersal via specialized animals

Functions and Importance of Desert Ecosystems

-  **Economic Importance**
- Mineral resources (e.g., salt, gypsum, copper)
- **Tourism:** Sand dunes, oases, camel safaris, desert festivals
- Traditional medicine and indigenous knowledge systems
- Solar energy potential due to abundant sunlight





Threats to Desert Ecosystems

- Despite seeming remote and barren, deserts are vulnerable.
- **Desertification:** Expansion of desert conditions due to deforestation, overgrazing, and poor land use
- **Climate change:** Increasing temperatures and shifting rainfall patterns
- Mining and resource extraction
- Tourism impacts (e.g., off-road vehicles damaging habitats)
- Loss of native species due to habitat disturbance

Conservation and Sustainable Use

- To protect and sustainably manage desert ecosystems:
- Prevent desertification through sustainable agriculture and grazing
- Reforestation with drought-tolerant species
- Water harvesting and efficient irrigation (e.g., drip systems)
- Protected desert reserves and eco-sensitive zones
- Raise awareness among local communities and tourists



THANK YOU