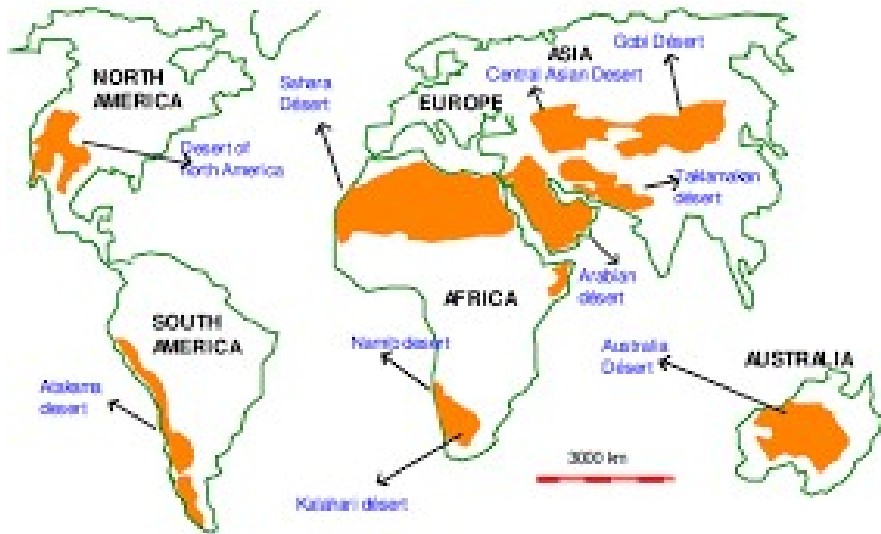


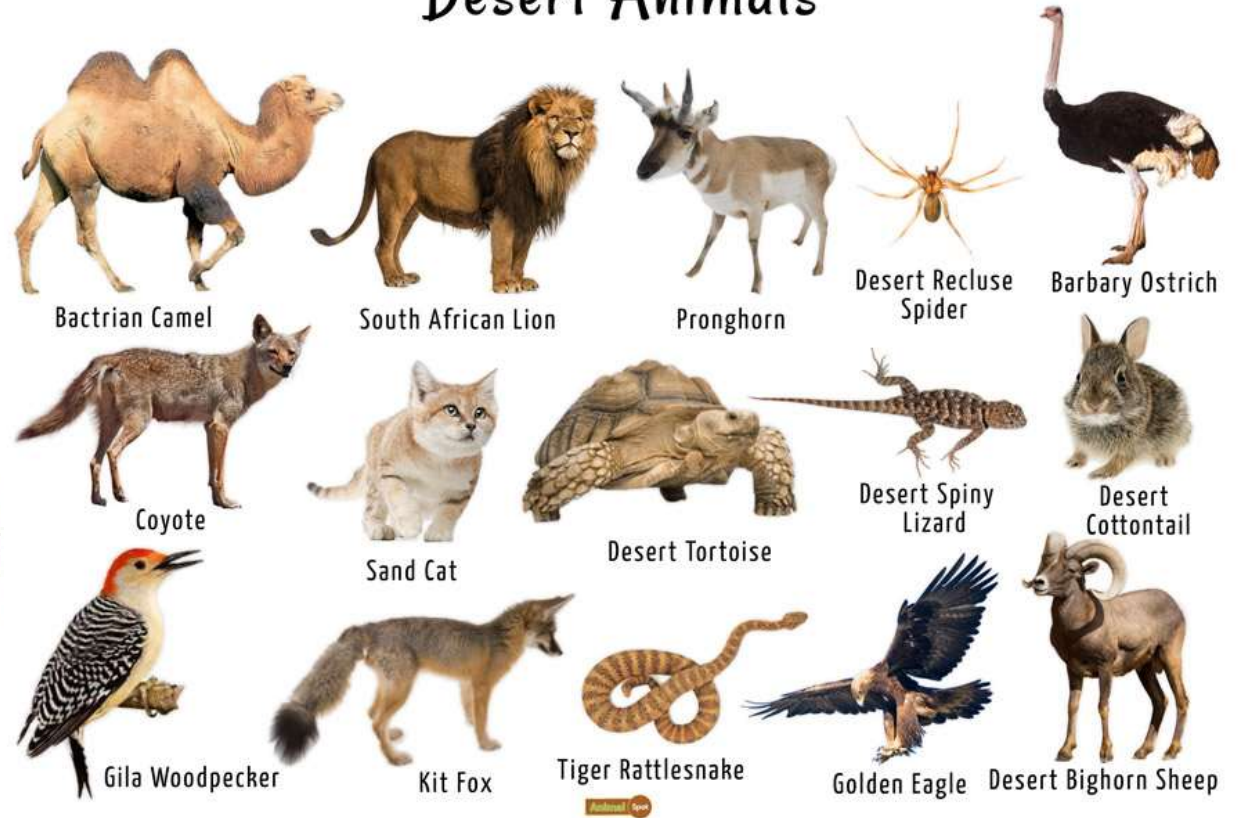
Zoogeography

Lesson 10

Desert

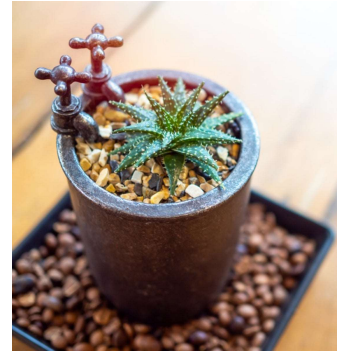


Desert Animals



Xerocole species

Diet: What do desert animals eat?



Some animals, like camels, and kangaroo rats **derive a lot of moisture from succulent plants** like cactuses.

While some species may extract nectar or sap from different plants, others may get their water from the plant parts they eat.

Since insects are also a plenty in the desert, they become a regular source of food for many birds, reptiles, and bats.

Carnivores like hyenas, leopards, and lions that are at the top of the food chain, get their share of **water from** the bodies of their **prey**. Some examples of omnivores include coyotes and ravens.

Metabolic water: Rodents and some groups of desert birds (e.g., larks) are able to convert these energy sources into water:





TABLE 27.3 Average gross amount of metabolic water formed in the oxidation of pure foodstuffs

The values in this table apply to the oxidation of materials that have been absorbed from a meal and to the oxidation of materials stored in the body. To emphasize this, the materials are called foodstuffs rather than foods. The gross amount of metabolic water formed is, by definition, simply the amount made by the oxidation reactions.

| Foodstuff | Grams of H ₂ O formed per gram of foodstuff |
|------------------------------------------------|--------------------------------------------------------|
| Carbohydrate ^a | 0.56 |
| Lipid | 1.07 |
| Protein with urea production ^b | 0.40 |
| Protein with uric acid production ^b | 0.50 |

Source: After Schmidt-Nielsen 1964.

^aStarch is assumed for the specific value listed.

^bWater yield in protein catabolism depends on the nitrogenous end product.

ANIMAL PHYSIOLOGY 3E, Table 27.3
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TABLE 32.1

Water Balance in a Human and a Kangaroo Rat, a Desert Rodent

| | Human (%) | Kangaroo Rat (%) |
|------------------------------|-----------|------------------|
| Gains | | |
| Drinking | 48 | 0 |
| Free water in food | 40 | 10 |
| Metabolic water | 12 | 90 |
| Losses | | |
| Urine | 60 | 25 |
| Evaporation (lungs and skin) | 34 | 70 |
| Feces | 6 | 5 |

Source: Some data from K. Schmidt-Nielsen, *How animals work*. Cambridge University Press, 1972.

Conservation Status

The population of many animals and birds of the desert have been reduced to mere hundreds because of **overhunting by mankind**. The IUCN considers many species as endangered, including the Egyptian tortoise, gazelles, antelopes, Saharan cheetah, fennec foxes, caracals, and pronghorns. Conservation efforts are, however, underway to save them from going extinct.



Testudo kleinmanni



Acinonyx jubatus hecki



Caracal caracal

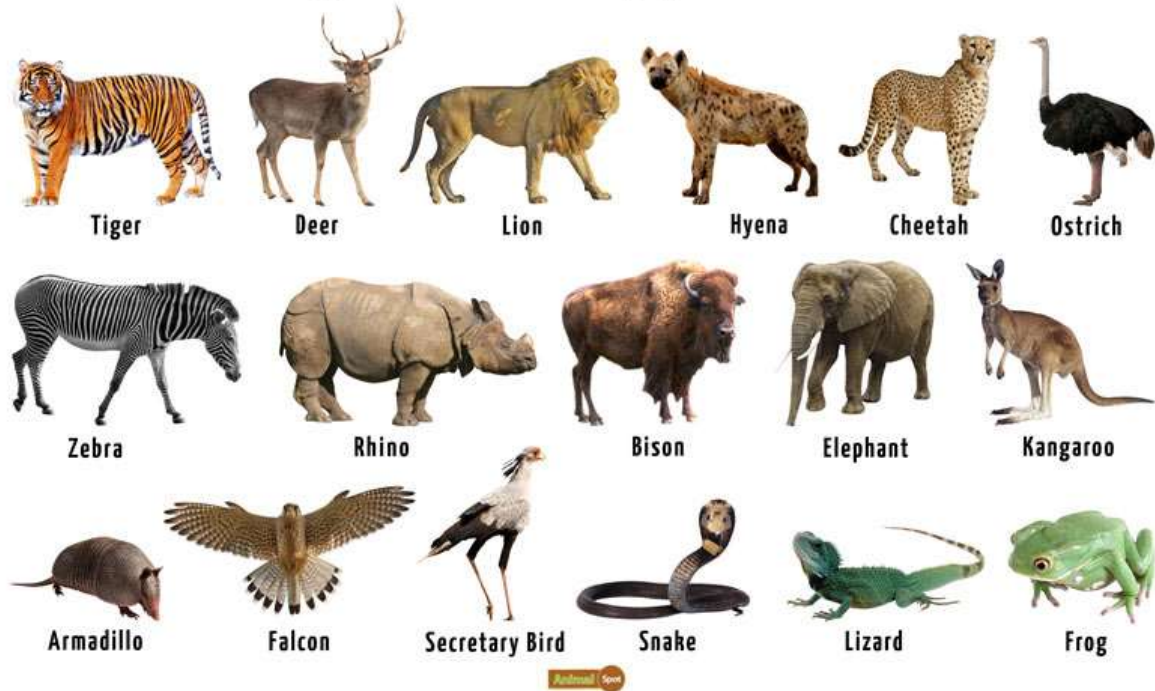


Antilocapra americana

Grassland (40% of the world's land area excl. Antarctica and Greenland)



Grassland Animals

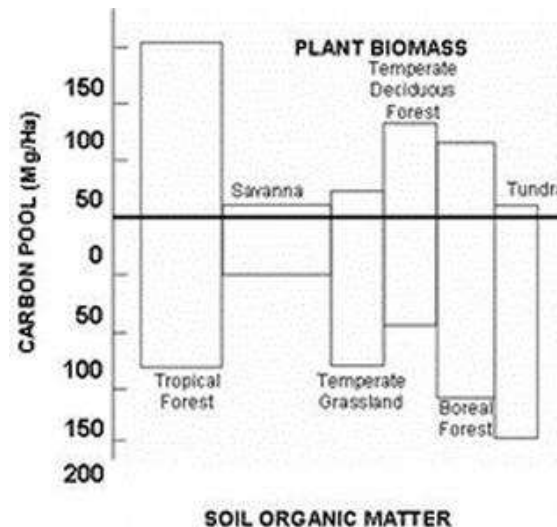


- Grassland biomes consist of **large open areas of grass**. Trees can be present, but they are infrequent. The animals found in grasslands range from African elephants (*Loxodonta africana*) to various species of prairie dogs (*Cynomys* spp.).
- **Low rainfall, wildland fires**, and **grazing** by animals are three factors that maintain grasslands. In grassland regions, the climate is ideal for the growth of grasses only.
- Types of grasslands include savannas and temperate grasslands



C storage

- Their importance is to the variety of **ecosystem services** that they provide: livestock grazing areas, water catchments, biodiversity reserves, tourism sites, recreation areas, religious sites, wild food sources, and natural medicine sources.
- An important function of grasslands is their sequestration and storage of carbon (C).



- Both managed and wild grasslands are susceptible to localized and **widespread fires** if climate conditions (drought and wind) are conducive to fire spread



(a)



(b)



(c)



(d)



(e)

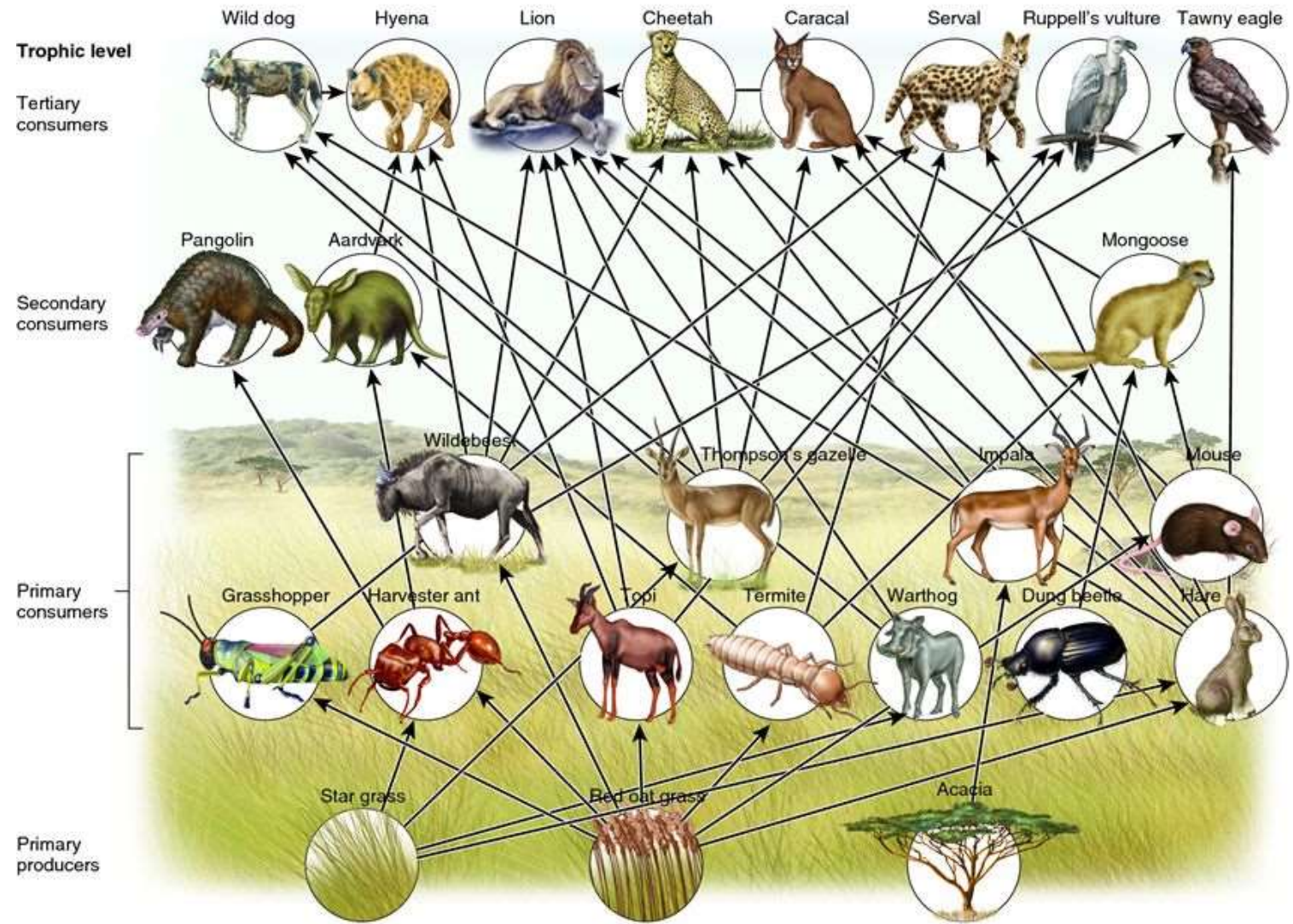


(f)

- This habitat type is home to the **fastest animal** (cheetah), the **largest terrestrial mammal** (African bush elephant), the **largest bird** (ostrich), as well as the **heaviest snake** (green anaconda) in the world.
- The prairie grasslands found in North America have been **reduced to about 2% of their original area** due to urbanization, endangering the existence of the wildlife it supports.



Food chain



Adaptations



- Many animals have **feet, paws, and snouts** such that they can **burrow into the ground** to avoid the daytime heat and stay safe from predators in their otherwise open habitat.
- Most of these species have **digestive systems** especially evolved for **processing grass**, which forms a major portion of their diet.
- Numerous animals have body colours to help them blend in seamlessly with their grassland habitat.
- Some animals are **nocturnal**, adapted with keen eyesight enabling them to hunt in the dark without any difficulty.

- **Humans have had a dramatic impact** on the grassland biome. Because temperate grasslands have **rich soil**, most of the grasslands in the United States have been converted into fields for **crops or grazing land for cattle**. The loss of grasslands due to agriculture has affected several species, including monarch butterflies (*Danaus plexippus*).



- In the African savannas, **illegal hunting** has resulted in the loss of many **large animals**, including elephants. The elephants protect the grasses of the savanna by crushing trees and shrubs. Without large animals around to stomp down the trees, they can more readily overtake the grasses, **causing savannas to turn into forests**. The resulting loss of the grasses would mean less food for grazing animals such as Grevy's zebras (*Equus grevy*).



- Grasslands could help **mitigate climate change**: One study found California's **grasslands and rangelands could store more carbon than forests** because they are **less susceptible to wildfires and drought**. Still, only a small percentage—less than 10 percent—of the world's grassland is protected.



https://www.youtube.com/watch?v=XmtXC_n6X6Q

Taiga (or Boreal forest)

- Taiga covers 11.5% of the Earth's land area
- Coniferous forests (Eurasia and North America)
- the world's largest land biome
- it exists from the last 12,000 yrs, since the beginning of the Holocene
- After the permanent ice caps and tundra, taiga is the terrestrial biome with the **lowest annual average temperatures.**
- small variety of animals due to the harshness of the climate



- Cold winters and short summers: challenging for reptiles and amphibians, which depend on environmental conditions to regulate their body temperatures.
- only a few species in the boreal forest including red-sided garter snake, common European adder, blue-spotted salamander, northern two-lined salamander, Siberian salamander, wood frog, northern leopard frog, boreal chorus frog, American toad, and Canadian toad are adapted to Taiga's conditions.



Thamnophis sirtalis



Viper berus



Ambystoma laterale



Lithobates sylvaticus

- More than 300 species of birds have their nesting grounds in the taiga → only 30 stay for the winter.

Fires



- It plays a role in shaping the forest (e.g. dominant stand-renewing disturbance through much of the Canadian boreal forest)
- ***Fire regime :***
 - (1) fire type and intensity (e.g., crown fires, severe surface fires, and light surface fires),
 - (2) size of typical fires of significance (The dominant fire regime in the boreal forest is high-intensity crown fires or severe surface fires of very large size, often more than 10,000 ha (100 km²), and sometimes more than 400,000 ha (4000 km²).[46])
 - (3) frequency or return intervals for specific land units (named fire rotation (Heinselman 1973) or fire cycle (Van Wagner 1978))

Human activities

- Some of the larger cities situated in this biome are Murmansk, Yakutsk and Arkhangelsk (Russia), Anchorage (Alaska), Yellowknife (Canada), Tromsø (Norway), Luleå and Oulu (Finland).

Large areas of Siberia's taiga have been harvested for lumber since the collapse of the Soviet Union.

In Canada, only **8%** of the taiga is protected from development, and the provincial governments allows clearcutting to occur on Crown land, which destroys the forest in large blocks.



Products from logged boreal forests include toilet paper, copy paper, newsprint, and lumber. More than 90% of boreal forest products from Canada are exported for consumption and processing in the United States.



Climate change

- In Alaska, the length of the frost-free season has increased from 60 to 90 days in the early twentieth century to about 120 days a century later



to increase water stress and reduce tree growth in dry areas (central Alaska, western Canada and portions of far eastern Russia)

Precipitation is relatively abundant (Scandinavia, Finland, northwest Russia and eastern Canada) and where a longer growth season accelerates tree growth -> replacement with temperate forests



Increase of outbreaks of insect pests (forest-destroying plagues): -
Dendroctonus rufipennis in Yukon and Alaska
- *Choristoneura fumiferana* in North America

