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### Biomes

Biome -

There are many terrestrial biomes on Earth

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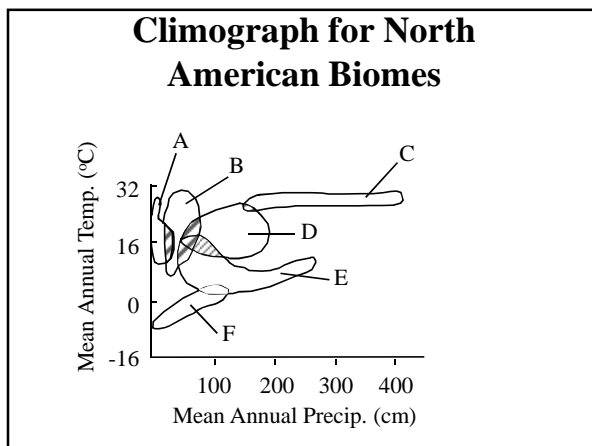
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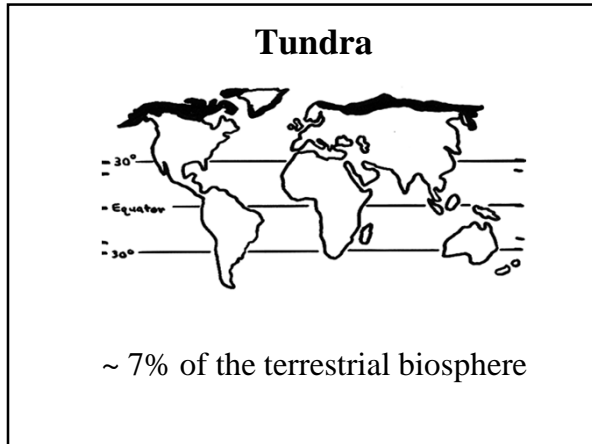
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### Two types of tundra

- Arctic  
*Climate & Location*

*Soils*

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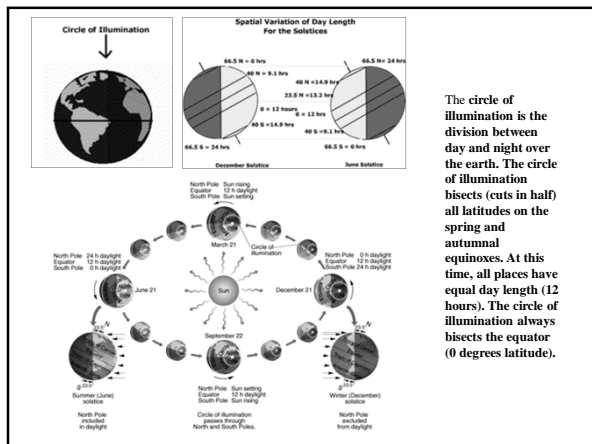
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The circle of illumination is the division between day and night over the earth. The circle of illumination bisects (cuts in half) all latitudes on the spring and autumnal equinoxes. At this time, all places have equal day length (12 hours). The circle of illumination always bisects the equator (0 degrees latitude).

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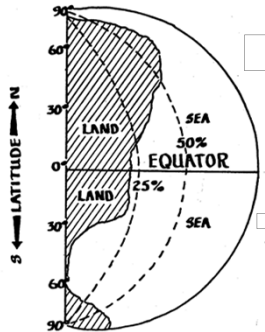
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### Not Found in S. Hemisphere



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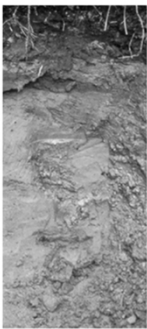
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### Dominant Soil Order is: Gelisol



**Gelisol**

Presence of permafrost or soil temperature of 0°C or less within 2 meters of the surface; formed through the process of gleization.

*Wet conditions slow decay allowing organic matter to accumulate and organic acids to be released. Organic acids react with iron to give a black/bluish-gray color.*

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### Arctic tundra

*Vegetation*

Productivity is low (ca. 103 g C m<sup>-2</sup> yr<sup>-1</sup>)  
2% of total terrestrial productivity  
on Earth

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### Arctic tundra

*Animals*

Year round –

Winter –

Migrants –

Essentially no reptiles & amphibians

Why???

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### May have large oscillations in population size

**Brown Lemmings**

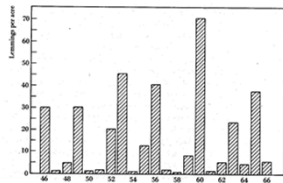


Figure 2.7 Population densities in summer of brown lemming (*Lemmus sibiricus*) at Point Barrow, Alaska. (After Schutz 1969)

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## Changes in Latitude Changes in Altitude

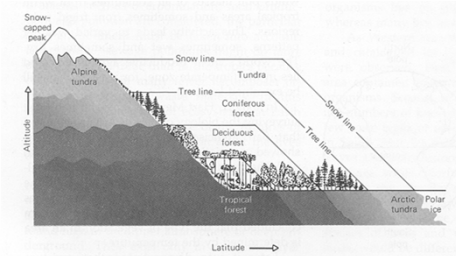


Figure 7-3 Vegetation changes with latitude and altitude. Temperature, which affects vegetation, falls as one travels up a mountain or away from the Equator, so that if there is plenty of moisture, vegetation is similar at high altitudes and at high latitudes as shown here.

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## Alpine tundra

Communities similar to arctic tundra

However:

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## Human Impacts



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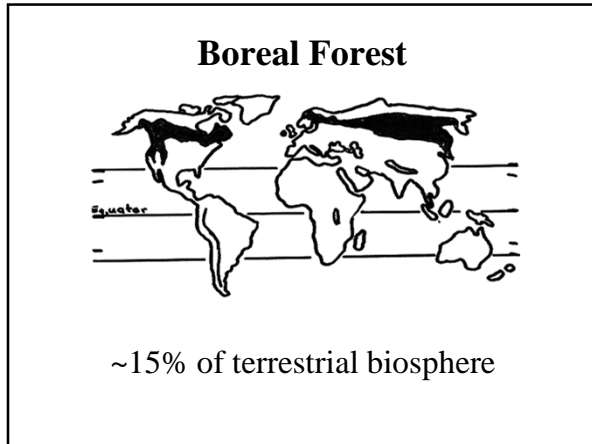
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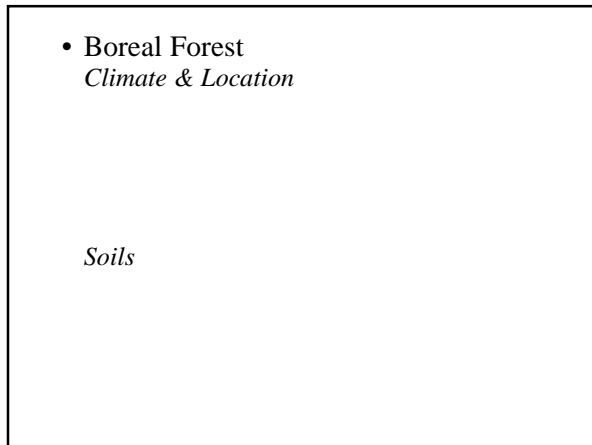
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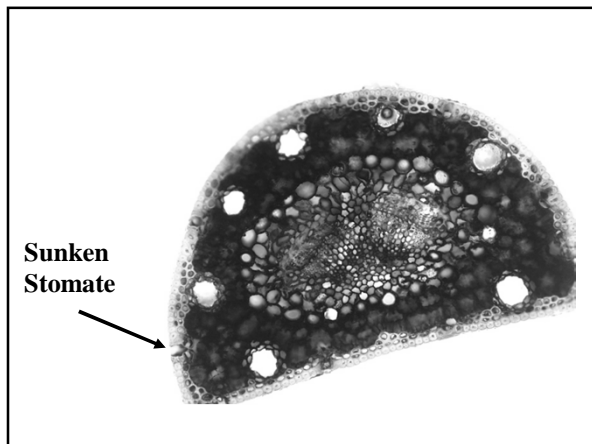
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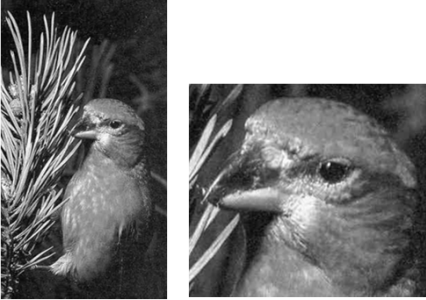
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### Boreal Forest

*Animals*



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### Boreal Forest

*Animals*

herbivores –

predators -



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### Human Impacts



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### Temperate Deciduous Forest



~11% of terrestrial biosphere

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### Temperate Deciduous Forest

*Climate & Location*

*Soils*

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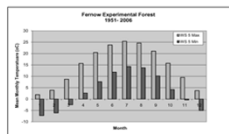
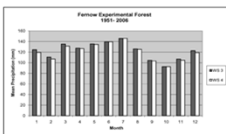
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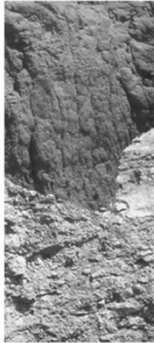
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### Alfisols, Inceptisols, & Ultisols are a common soil orders



#### Alfisol

Shallow penetration of humus;  
translocation of clay; well-  
developed horizons.

*Leaching of clays from the topsoil and into  
the subsoil.*

**Inceptisols** are young soils that are weakly  
developed.

**Ultisols** are older soils that have been  
intensely leached creating cation poor,  
acidic, and clay & iron enriched subsoils.

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### Temperate Deciduous Forest

#### *Vegetation*

Productivity is high (ca.  $638 \text{ g C m}^{-2} \text{ yr}^{-1}$ )  
17% of total terrestrial productivity  
on Earth

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### Temperate Deciduous Forest

#### *Animals*

Greater variety

Characteristic mammals

Many birds & insects  
Adapted to seasonality

Amphibians & reptiles are present

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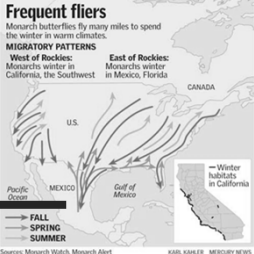
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### Monarch Butterflies



**Frequent fliers**  
Monarch butterflies fly many miles to spend the winter in warm climates.

**MIGRATORY PATTERNS**  
West of Rockies: Monarchs winter in California, the Southwest  
East of Rockies: Monarchs winter in Mexico, Florida



Sources: Monarch Watch, Monarch Alert  
KARL KAHLE / MEGURY NEWS

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### “Light sleeper”



### True Hibernator



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### Gray Tree Frog



### Unfrozen



### Frozen

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**Temperate forests have been strongly influenced by human activities.**



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### **Tropical Forests**



~23% of terrestrial biosphere

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### Tropical Forests

*Climate & Location*

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### Three Types

- Tropical Thorn Forest  
Pronounced dry season; thorny shrubs & trees; found in S. America, S. Africa, & India; little rainfall
- Tropical Deciduous Forest  
Distinct wet & dry seasons; found in Central America, S. America, India, & Asia

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### Tropical Rain Forests

*Climate & Location*

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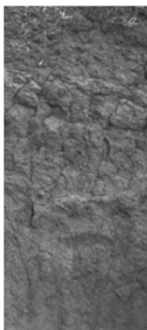
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### Oxisols are a common soil order



**Oxisol**

Highly weathered soils with nearly featureless profile; red, yellow or gray; rich in kaolinite, iron oxides, and often humus; in tropics and subtropics.

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## Tropical Rain Forests

### *Vegetation*

Highest productivity (ca.  $911 \text{ g C m}^{-2} \text{ yr}^{-1}$ )  
36% of total terrestrial productivity on Earth  
If you consider all types of tropical forests,  
then they account for 49% !!!

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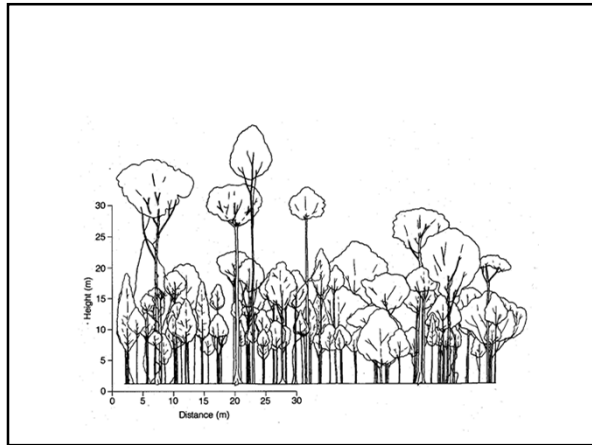
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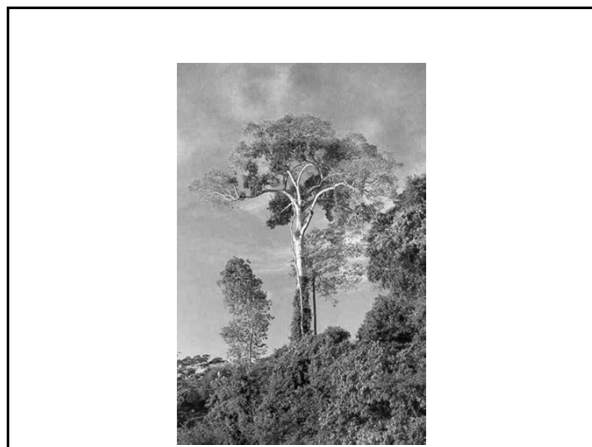
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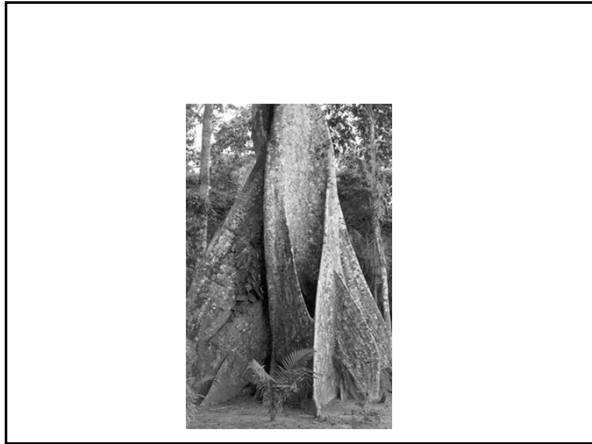
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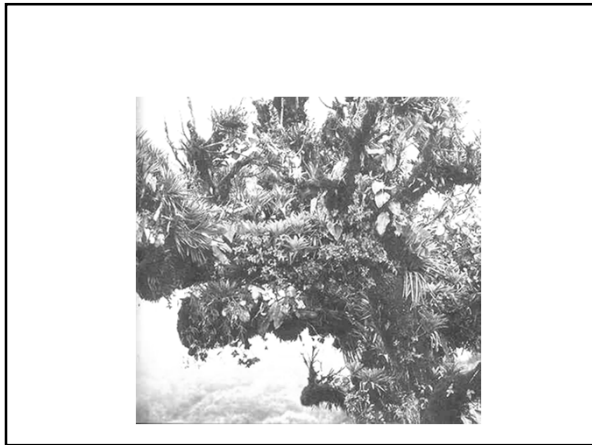
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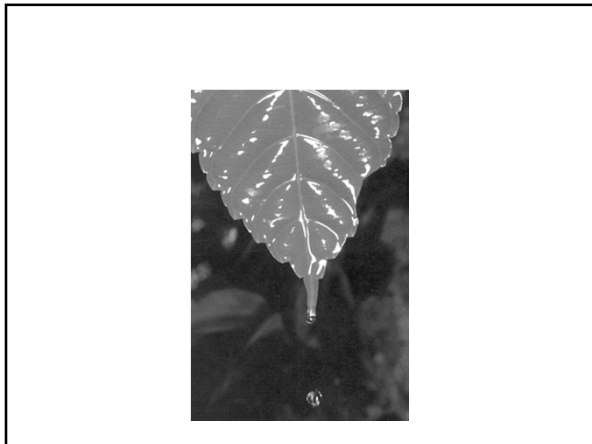
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## Tropical Rain Forests

*Animals*

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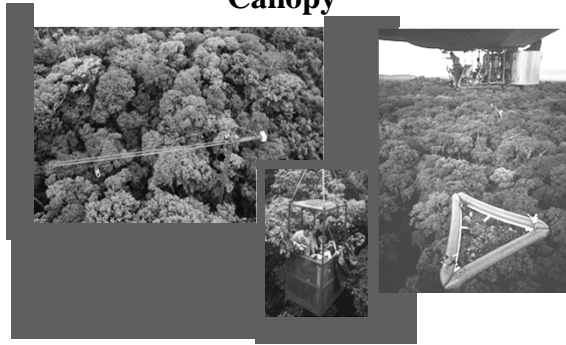
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## The Challenge of Research in the Canopy



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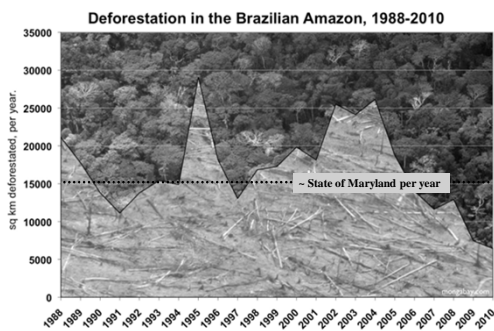
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## Deforestation in Brazilian Amazonia



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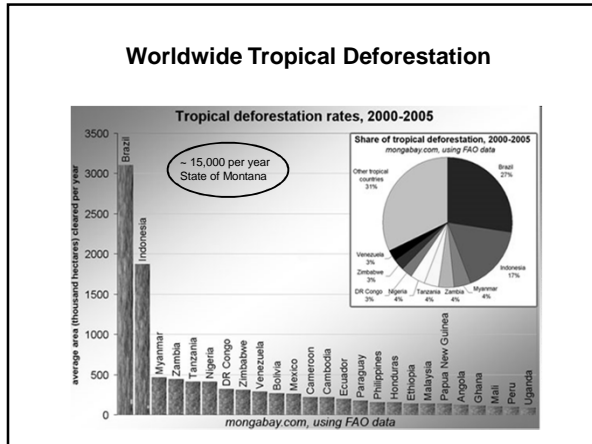
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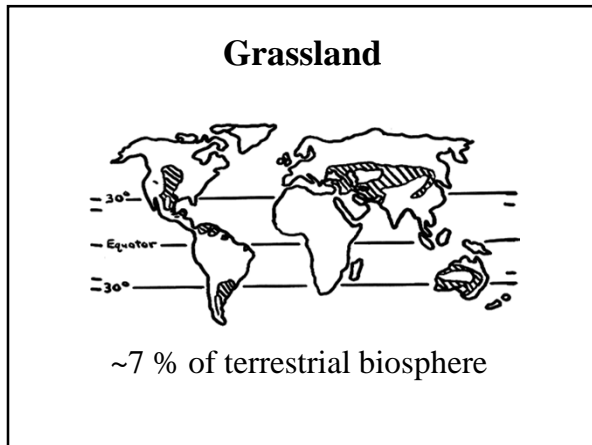
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### Grasslands

*Climate & Location*

Many names depending on location:

Amount of rainfall effects the height of the grass

wet (75 cm) =====> (40 cm) =====> Dry (25 cm)

Tall (2m)            Short (0.5 m)            Bunch grass

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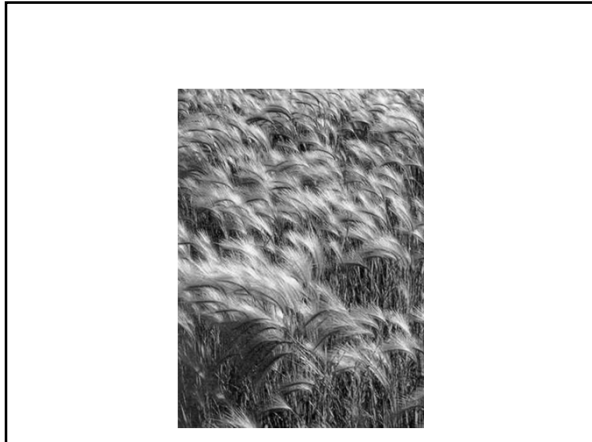
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**Temperate Grassland Soils**

- Thick mat of roots & rhizomes
- High organic matter => 19.2 kg C m<sup>-2</sup>
- Dominant soil order = Mollisols



**Mollisol**

Surface horizons dark brown to black with soft consistency; rich in bases; soils of semi-humid regions; prone to the process of calcification.

*Characteristically form under grass in climates with strong seasonal dry periods.*

*Fairly high in organic matter.*

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**Grasslands**

*Vegetation*

Productivity is low (ca. 266 g C m<sup>-2</sup> yr<sup>-1</sup>)  
4% of total terrestrial productivity on Earth

*Animals*

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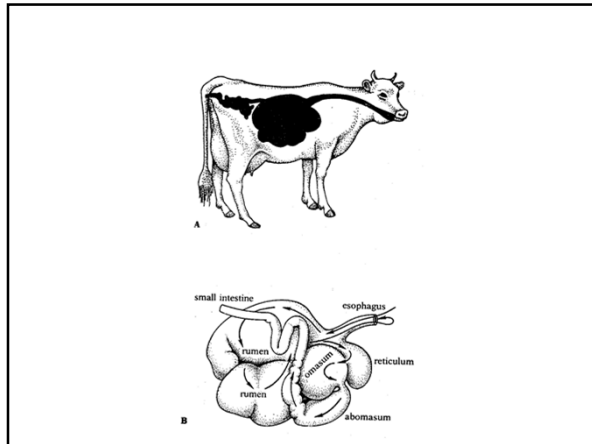
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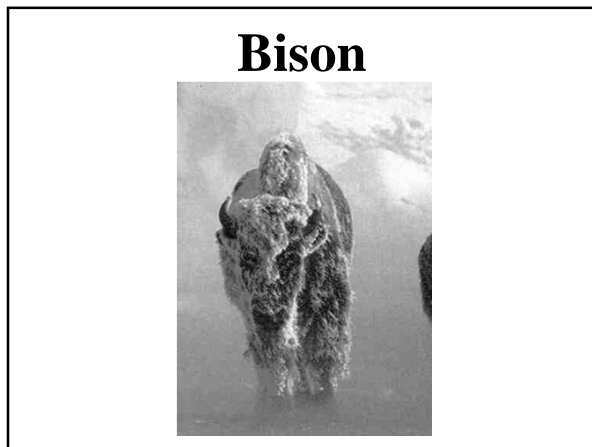
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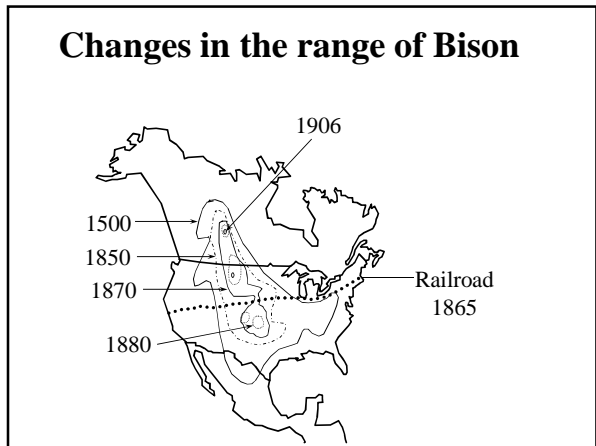
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### Changes in the range of Bison



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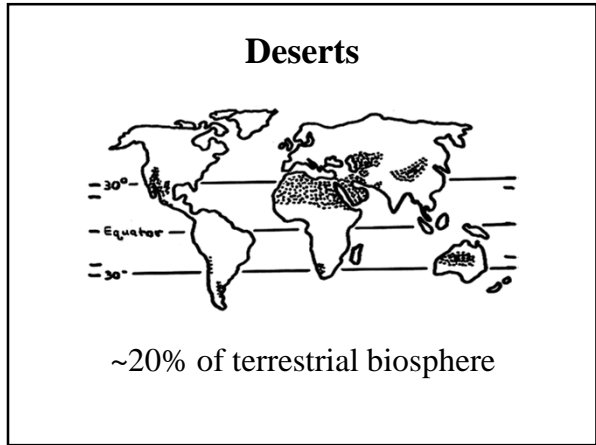
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### Deserts



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Deserts & arid lands  
*Climate & Location*

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**Desert Soils**



**Caliche** →

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**Aridisols are a common soil order**



**Aridisol**

Develop in very dry environments; low in organic matter; high in base content; prone to the process of salinization.

*Often accumulate calcium carbonate, gypsum, salt, & other easily leached minerals in the subsoil.*

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**Deserts**

*Vegetation*

Adaptations to conserve water

lowest productivity ca.  $95 \text{ g C m}^{-2} \text{ yr}^{-1}$   
5% of total terrestrial productivity on Earth

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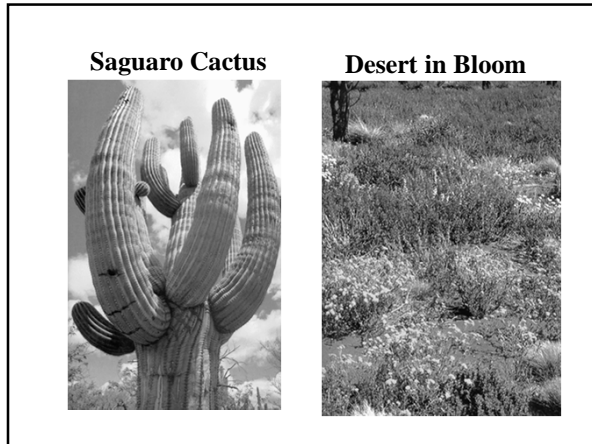
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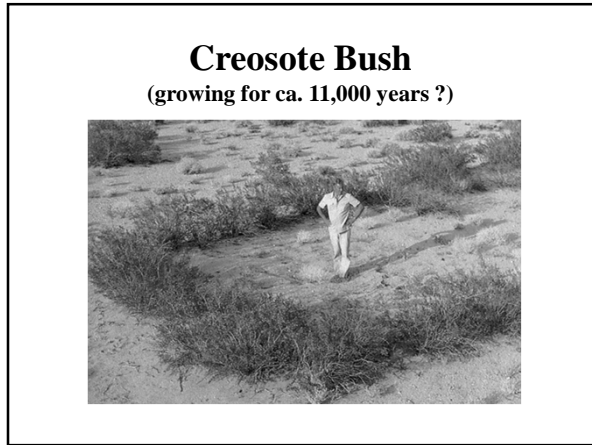
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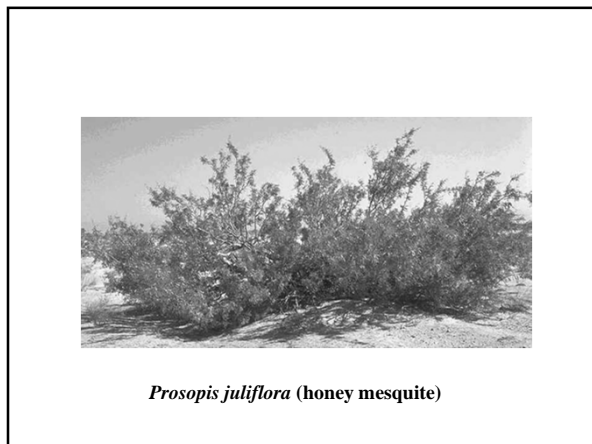
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**Deserts**

*Animals*

Adaptations to conserve moisture & keep cool

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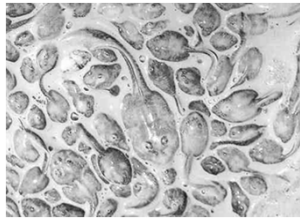
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**Spadefoot Toad**



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**The Camel's Hump**

*Is not filled with water! Rather ectopic fat storage.*



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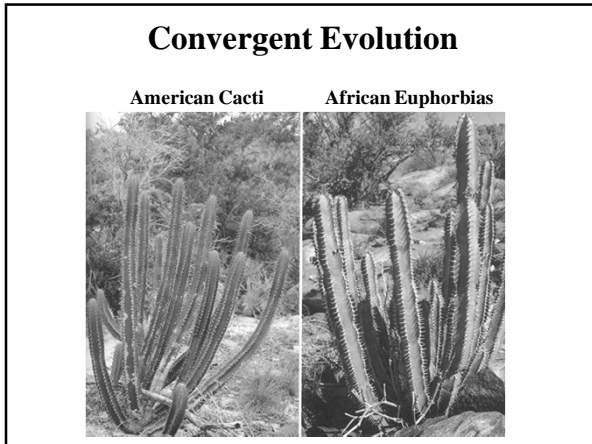
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Extreme environments, such as deserts, often contain examples of convergent evolution.

Convergent Evolution -

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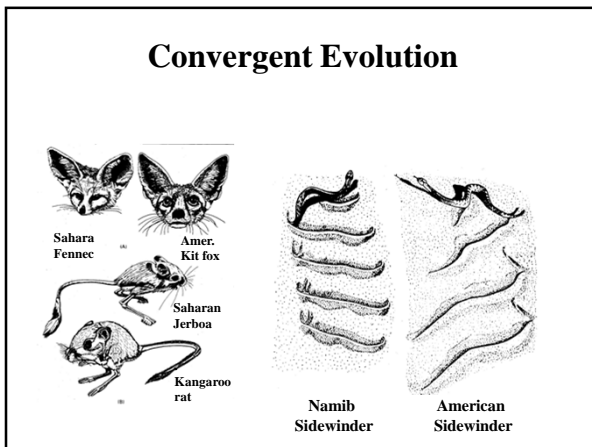
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