Moving from organisms to communities and ecosystems and the biosphere -

Ecology

it's the scientific study of the relation of living organisms to each other and their surroundings.

Population ecology is the study of how and why populations change

- **Population**
  - A group of individuals of a single species that occupy the same general area
- Individuals in a population
  - Rely on the same resources
  - Are influenced by the same environmental factors
  - Are likely to interact and breed with one another

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Communities and Ecosystems

- All communities and ecosystems have certain features in common
- Each type of ecosystem has its own unique structure and dynamics
- Human activities can disrupt the balance of ecosystems

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A community includes all the organisms inhabiting a particular area

- Biological **community**
  - An assemblage of populations living close enough together for potential interaction
  - Described by its species composition
- Boundaries of the community vary with research questions
  - Can be a pond
  - Can be the intestinal microbes of a pond organism

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Interspecific interactions are fundamental to community structure

- **Interspecific interactions**
  - Relationships with other species in the community
- **Interspecific competition**
  - Two different species compete for the same limited resource
    - Squirrels and black bears
    - Compete for acorns

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TABLE 37.2 INTERSPECIFIC INTERACTIONS

Interspecific Interaction	Effect on Species 1	Effect on Species 2	Example
Competition	−	−	Squirrels/black bears
Mutualism	+	+	Hippo/microbes in hippo stomach
Predation	+	−	Crocodile/fish
Herbivory	+	−	Hippo/grasses
Parasites and pathogens	+	−	Heartworm/dog; *Salmonella*/humans

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Trophic structure is a key factor in community dynamics

- **Trophic structure**
  - A pattern of feeding relationships consisting of several different levels
- **Food chain**
  - Sequence of food transfer up the trophic levels

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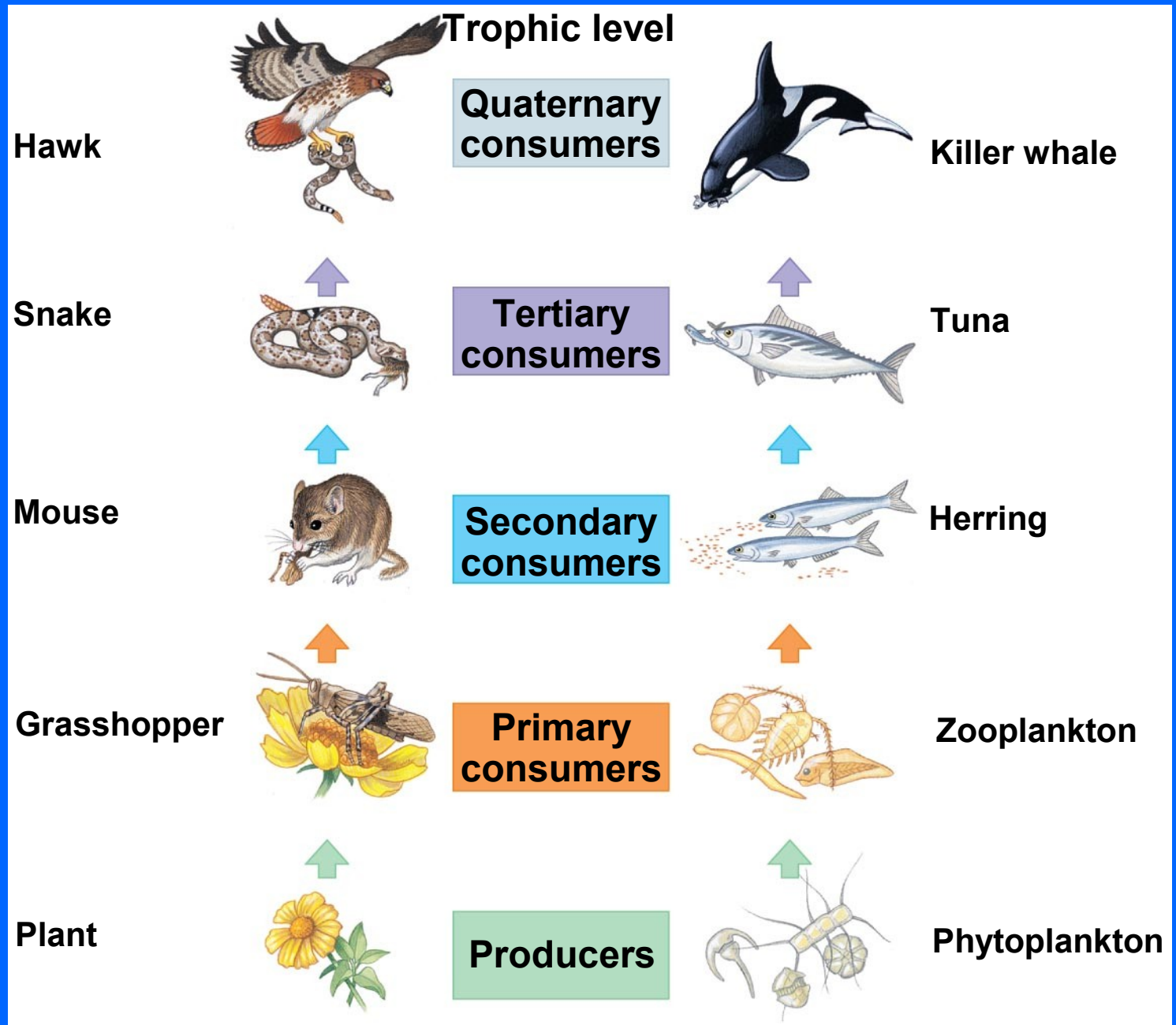

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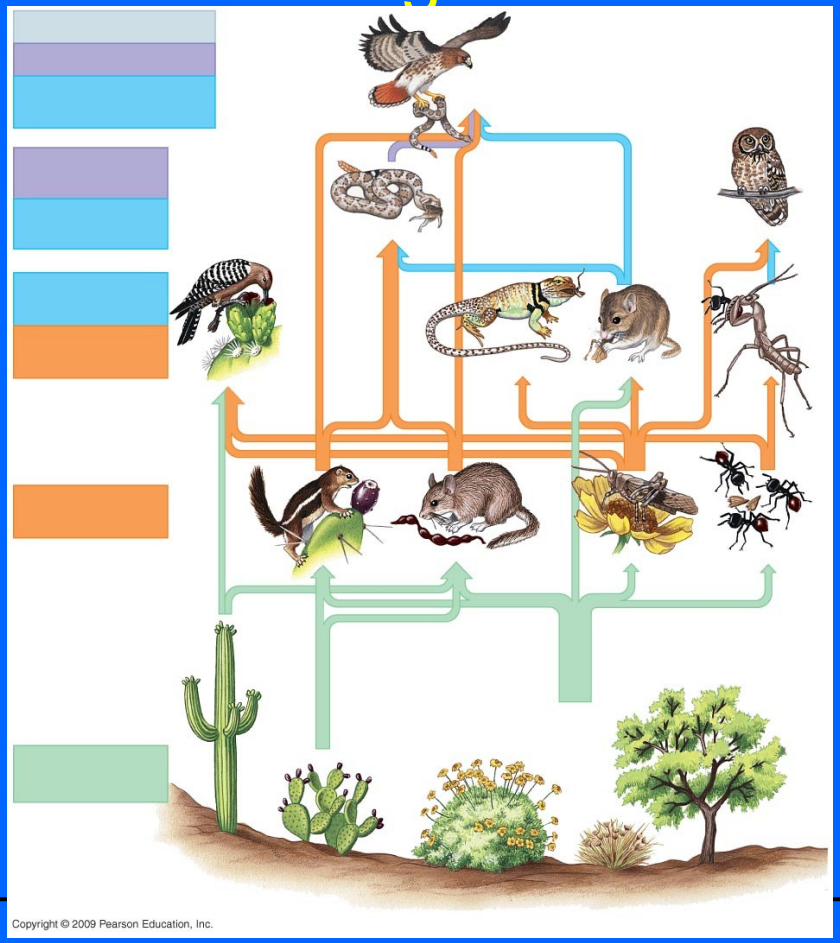
Food chains interconnect, forming food webs

- **Food web**
  - A network of interconnecting food chains



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Ecosystems & the Biosphere

- **Ecosystem**
  - All the organisms in a community as well as the abiotic environment
- The global ecosystem is called the biosphere
  - It is the sum of all the Earth's ecosystems
  - The biosphere is the most complex level in ecology

The biosphere can be divided into different biomes
For example, aquatic & terrestrial biomes

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- Ecosystem interactions involve living (**biotic**) communities and nonliving (**abiotic**) components
  - Biotic components include all organisms
  - Abiotic components include atmospheric gases, energy, nutrients, and water
    - Organisms are affected by both components of their environment
    - Their presence and activities often change the environment they inhabit

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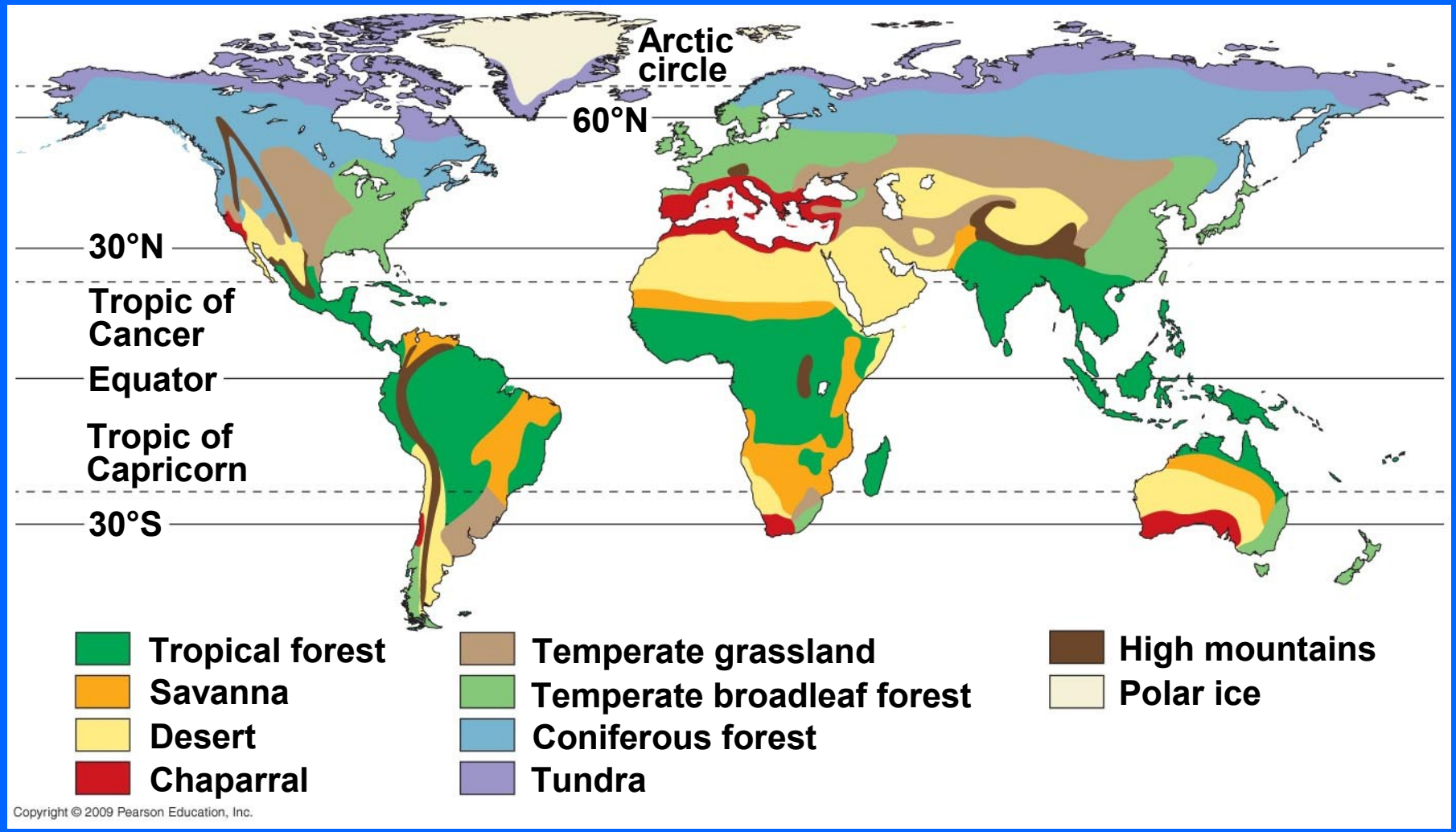
Types of Terrestrial biomes



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Tropical forests cluster near the equator

- Several types of **tropical forests** occur in the warm, moist belt along the equator
  - The tropical rain forest is the most diverse ecosystem on Earth
  - Large-scale human destruction of tropical rain forests continues to endanger many species
    - It may also alter world climate

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Savannas are grasslands with scattered trees

- Drier, tropical areas and some nontropical areas are characterized by the **savanna**

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Deserts are defined by their dryness

- **Deserts** are the driest of all terrestrial biomes
  - They are characterized by low and unpredictable rainfall

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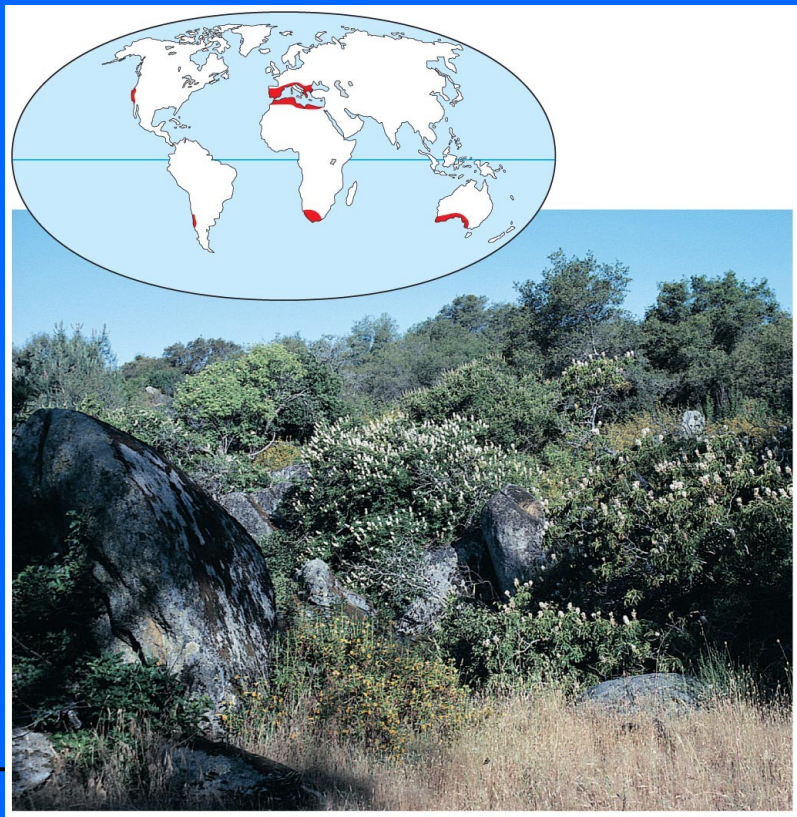
Spiny shrubs dominate the chaparral

- The **chaparral** biome is a shrubland with cool, rainy winters and dry, hot summers
  - Chaparral vegetation is adapted to periodic fires



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Temperate grasslands include the North American prairie

- **Temperate grasslands** are found in the interiors of the continents, where winters are cold
  - Drought, fires, and grazing animals prevent trees from growing
  - Farms have replaced most of North America's temperate grasslands

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Broadleaf trees dominate temperate forests

- **Temperate broadleaf forests** grow where there is sufficient moisture to support the growth of large trees
  - Nearly all of the original broadleaf forests in North America have been drastically altered by agriculture and urban development

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Coniferous forests are often dominated by a few species of trees

- The **northern coniferous forest**, or taiga, is the largest terrestrial biome on Earth
  - The taiga is characterized by long, cold winters and short, wet summers

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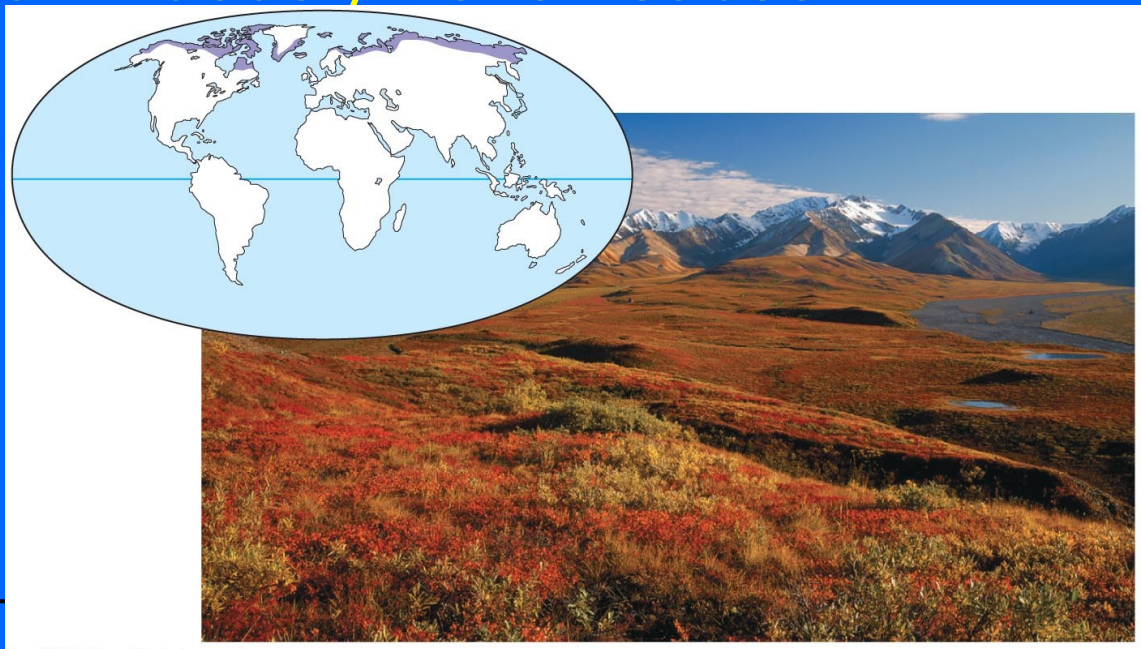
Long, bitter-cold winters characterize the tundra

- The **arctic tundra** lies between the taiga and the permanently frozen polar regions
  - It is a treeless biome characterized by extreme cold, wind, and permafrost
  - **Permafrost** is continuously frozen subsoil



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