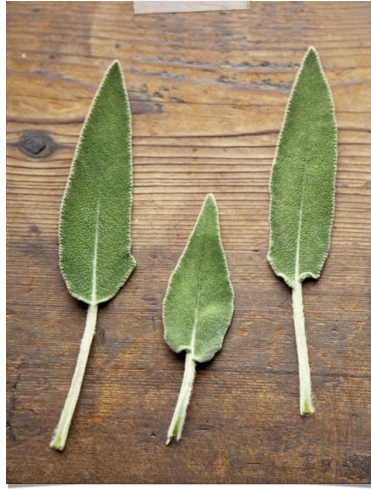


Chapter 34: The Biosphere

Honors Biology
2013



1

The Biosphere

- * extends from the atmosphere several kilometers above the Earth to the depths of the ocean
- * all of the Earth that is inhabited by life
- * Some places that contain life are surprising.



2

Variables That Affect Organisms

- * Biotic Factors - living components of the environment
- * Abiotic Factors - nonliving components of the environment
- * Habitat - specific environment in which an organism lives that includes both biotic and abiotic factors

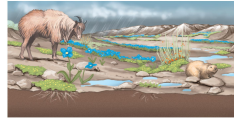
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Levels of Organization

- * **Organism** - one individual of a particular species
- * **Population** - group of individuals of the same species in the same place at the same time
- * **Community** - many populations living close enough for interactions (all of the biotic factors in a particular environment)
- * **Ecosystem** - includes the biotic and abiotic components of an environment



Fig. 34.1 A-D



4

Landscapes

- * **Landscapes** - arrays of ecosystems
- * **Can be visible from the air as patches**



Fig.
34.2A

5

Ecology ≠ Environmentalism

- * **Ecology** is the science we use to understand interactions within the environment
- * **Environmentalism** is a social movement created to raise and solve environmental concerns
- * **Environmentalist** will use ecological data to support their claims

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Pesticides

- * DDT can be sprayed on a field by airplanes and eradicate all of the crop-killing insects
- * It increased crop yields significantly
- * Also used to kill disease carrying insects like mosquitos (malaria), body lice (typhus), and fleas (plague)
- * Two problems:
 - * Pesticide resistance
 - * Silent Spring by Rachel Carson

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Rachel Carson

- * Alerted the public to the dangers of pesticide use
- * Highlighted impact on birds
 - * DDT builds up (biomagnification) in tissues of living organisms. The higher you are up the food chain, the more it impacts you.
- * DDT can be found anywhere on Earth (even where it has not ever been used)
- * Carson is credited with starting the modern environmental movement.



Fig. 34.2B

8

Energy Source

- * All organisms require energy to live
- * Most often the ultimate energy source is solar energy
- * In aquatic environments, photosynthesis can only happen at the surface because light can not penetrate very far.
- * In dark environments, other energy sources are required.
 - * Inorganic chemicals like sulfide used by bacteria.
 - * Tube worms can use the bacteria to produce its energy



Fig. 34.3A

9

Temperature



- * Abiotic Factor
- * Can have a huge impact on metabolism
 - * Temps close to 0°C are too cold for most organisms
 - * Temps above 45°C destroy enzymes
- * Exceptions:
 - * Bacteria in hot springs have special enzymes that only function at high temperatures
 - * Mammals and birds regulate their body temperature

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Water

- * Essential to all life
- * Water-tight coverings are essential to terrestrial animals
- * Aquatic are surrounded by water but solute concentrations can be a problem
 - * Freshwater organisms live in a hypotonic environment
 - * Marine organisms live in a hypertonic environment

- * Amount of species present depends on the nutrients available
- * Key nutrients for life:

Nutrients

- * nitrogen
- * phosphorus
- * This is also true in aquatic environments

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Other Aquatic and Terrestrial Factors

- * Aquatic Factors
 - * Oxygen (dissolved)
 - * Cold, fast-moving water is usually higher in dissolved oxygen
 - * Salinity - the amount of dissolved salts in the water
- * Terrestrial Factors
 - * Wind
 - * Can damage or create openings in forests (allows for colonization)
 - * Increases water loss through evaporation
 - * Fire

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Climate

- * Regional climate impacts how terrestrial communities are distributed
- * Climate patterns are largely determined by the amount of solar energy available
- * Tilt of the Earth determines the seasons
- * Tropics (region around the equator) receive the most direct sunlight

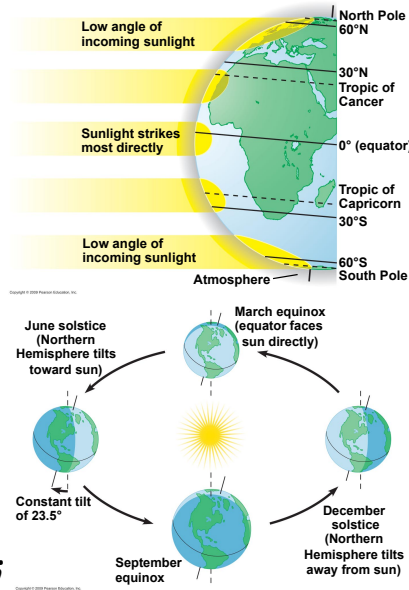


Fig. 34.5

13

Rain and Winds

- * Doldrums - area of calm or very light winds
- * Trade Winds - cooling winds in the tropics
- * Prevailing Winds - caused by rising and falling air masses and the Earth's rotation
 - * Earth moves faster at the equator (because it is a sphere)
 - * Trade winds (tropical, near equator) - east to west
 - * Westerlies (temperate zones) - west to east

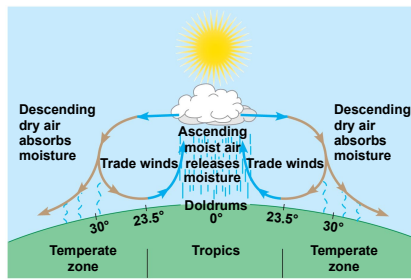
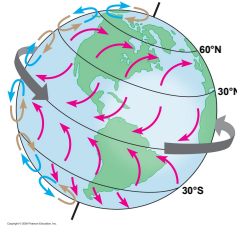


Fig. 34.5



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Ocean Currents

- * river-like flow patterns in the oceans
- * caused by prevailing winds, planet's rotation, unequal heating of surface water, and shapes of the continents
- * Impacts Climate:
 - * Gulf Stream brings warm water to Northern Europe, keeping it warmer

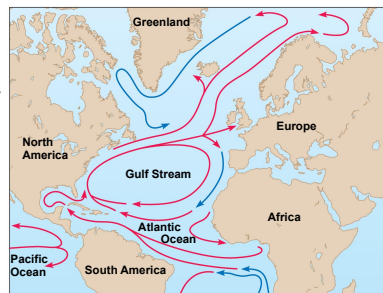


Fig. 34.5E

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Landforms

- * Air Temperature decreases 6°C every 1,000m increase in elevation
- * Rain Shadow

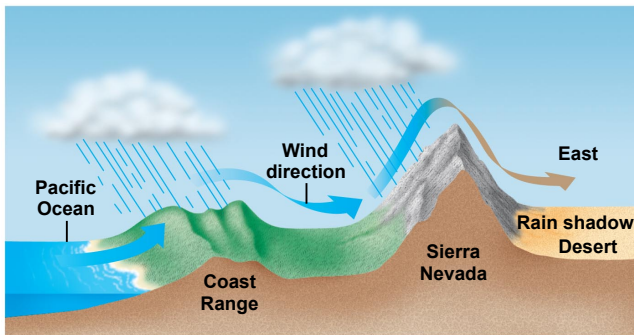


Fig. 34.5F

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Biomes

- * Climate and other abiotic factors control the distribution of organisms
- * These abiotic factors create biomes
- * Biomes - major types of ecological associations that occupy broad geographical regions of land or water

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Coral Reefs

- * Throughout the world
- * Exist in the photic zone of warm tropical waters above continental shelves
- * Reef is built by generations of coral animals that secrete a hard external skeleton
- * Support a huge variety of invertebrates and fish



Fig. 34.6B

18

Intertidal Zone

- * Where ocean meets the land
- * Shore is pounded by waves at high tide
- * Exposed to sun and drying winds during low tide
- * Home to: algae, barnacles, mussels, clams

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Estuary

- * Where freshwater stream or river merges with the ocean
- * Salinity ranges
- * High levels of nutrients from the rivers
- * Some of the most productive biomes on Earth
- * Variety of species: oysters, crabs, fish, and waterfowl



Fig. 34.6D

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Aphotic Zone

Fig. 34.6C

- * "Twilight Zone"
- * Not enough light for photosynthesis
- * Food sinks from the photic zone
- * Some animals migrate to the surface at night to feed
- * No Light Zone
- * Permanently dark
- * Adaptations: inward pointing teeth, bioluminescence
- * Most are bottom feeders
- * Low animal density except near hydrothermal vents where chemoautotrophic bacteria are present



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Freshwater Biomes

- * Like oceans, light has a big impact on freshwater biomes
- * Temperature
 - * In summer, lakes have a distinct upper layer that does not mix with underlying cooler water
 - * Fish stay in the cooler waters because more oxygen is dissolved there.
- * Nutrients
 - * Nitrogen and Phosphorus usually limit phytoplankton growth in a lake or pond
 - * If there are temperature layers, nutrients can be trapped at the bottom because no mixing occurs
 - * Some lakes and ponds have too many nutrients because of nitrogen and phosphorus runoff from sewage and fertilizers.
 - * This causes algal blooms and eventually serious oxygen depletion

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Rivers and Streams

- * Huge change between source and downstream
 - * Source - water is cold, low levels of nutrients, swift current, and clear
 - * Downstream - river widens and slows; warmer, murkier water; higher levels of nutrients



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Freshwater Wetlands

- * Marshes, swamps, and bogs
- * Usually near rivers or lakes
- * Huge species diversity
- * Help to reduce flooding by storing water
- * Help to filter pollutants



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