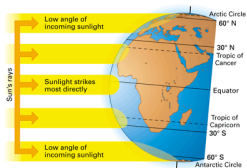


BIOMES

CLIMATE

- Produced by uneven heating of the planet by the sun
- Determines types of biomes
- Influences organisms that live in biomes
 - major abiotic factors
 - temperature range
 - amount of rainfall

Climate: Uneven Heating of Earth



Different locations on Earth receive different amounts of solar energy

- Equator:**
- sun's rays strike the Earth directly
- Farther from equator:**
- rays strike Earth at lower angle
 - solar energy has to be spread over larger area and absorb less heat
 - Areas absorb less heat and are colder the further away from the equator

- 3 Climate Zones**
- Tropics
 - Temperate zones
 - Polar zones

Climate: Precipitation

Uneven heating drives global patterns of winds and precipitation



- Near equator (0° latitude)
 - Warm air absorbs moisture, rises and forms clouds
 - Clouds produce rainfall
 - Reason why tropics have warm temps and heavy rainfall year round
- 30° N and 30° S latitudes
 - rays strike Earth at lower angle
 - Dry air descends and warms again
 - World's largest deserts found in these regions
- Higher/lower latitudes
 - Moving air absorbs moisture and produces precipitation again

Climate: Winds and Ocean Currents

Wind Patterns: produced by moving air masses and Earth's rotation

Ocean Currents: produced by combination of wind patterns, uneven heating of Earth's surface, rotation of the Earth, and shapes of the continents



Surface currents affect the climate on the continents

Local Climate

- Affected by:
 - large bodies of water
 - » absorb and release heat gradually
 - » shore areas - cooler in summer/ milder in winter
 - mountains
 - » air temperature declines as altitude increases
 - » climates on each side of mountain differ
 - one side wet, one side dry

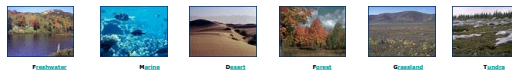


Microclimate

- the climate in a specific area that varies from the surrounding climate region
- may be as small as a few square feet or as large as many square miles

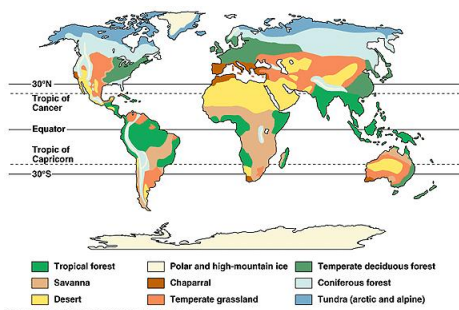


BIOMES



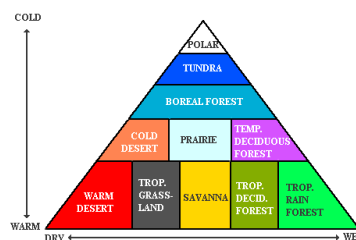
- the world's major communities (ecosystems)
- classified according to the predominant flora (vegetation) and fauna (animals)
- characterized by adaptations of organisms to that particular environment
- do not have distinct boundaries, overlap each other

Major Biomes of the World



[Biomes animation](#)

Biome type in relation to temperature and rainfall



Productivity of Biomes

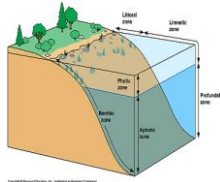
Basic Necessities for Photosynthesis

1. Sunlight
2. Water
3. Warm temperatures
4. Nutrients

AQUATIC BIOMES

- occupy most of the biosphere
1. **Freshwater:** average salinity 1% or less
lakes/ponds
rivers/streams
wetlands
 2. **Marine:** average salinity 3%
intertidal regions
coral reefs
oceanic pelagic zones
abyssal zones
 3. **Brackish:** mixture of salt/fresh
estuaries

Stratification of Aquatic Biomes



- Zones based on light penetration:
 - Vertical zones**
 - **photic zone** - light sufficient for photosynthesis
 - **aphotic zone** - light insufficient for photosynthesis
- Temperatures vary with depth
 - **Thermocline** - a narrow band of water where temperature suddenly changes

Freshwater



- **low salt concentration** - usually less than 1%
- plants and animals in freshwater regions would not be able to survive in areas of high salt concentration
- only 3% of the world's water is fresh
 - 99% of this is either frozen in glaciers and pack ice or is buried in aquifers
 - remainder is found in lakes, ponds, rivers, and wetlands
- **three zones**
 1. lakes and ponds
 2. rivers and streams
 3. wetlands

Freshwater

1. Lakes and Ponds

- Inhabited by fishes, otter, muskrat, ducks, loons, turtles, snakes, salamanders, frogs

A. eutrophic lakes

- rich in organic matter and vegetation
- waters relatively murky
- bacteria increase when feeding on decaying organisms, used dissolved oxygen, eventually using oxygen needed for other organisms
- * **eutrification**

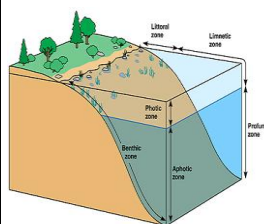


B. oligotrophic lakes

- little organic matter
- clearer water
- sandy or rocky bottom
- desirable fishery of large fish



Freshwater Lake Zones



- **littoral zone** - inshore, shallow, high light levels
- **limnetic zone** - offshore, high light levels, upper regions of water column
- **profundal zone** - aphotic
- **benthic zone** - bottom substrate often rich in detritus

Freshwater



2. Rivers and Streams

- Body of freshwater that flows in one direction down a gradient or slope toward its mouth
- Begin at headwaters: springs, snowmelt, or lakes
 - At source: cooler temp., clearer, higher O2 levels
 - Freshwater trout, heterotrophs
 - Middle: species diversity increases: green plants and algae
 - Mouth: murky from sediments, less light, less O2
 - Catfish, carp (need less O2)
- **Swift rivers** - fewer organisms, must adapt to currents
- **Slow moving** - richer in nutrients, greater diversity of life forms

Freshwater

3. Wetlands

- covered by fresh water for part of the year
- most productive freshwater ecosystems
- wide variety of birds, ducks, fishes, mammals, amphibian, invertebrates, and reptiles
- act as stop-overs for migratory animals
- act as flood control and filters to clean pollutants
 - **marshes**: woody plants such as cattails
 - **swamps**: woody plants such as trees and shrubs
 - **bogs**: dominated by mosses



Marine



- covers about 70% earth
- average depth 2.3 mi., deepest 6.8 mi.
- approximately 3% salinity
- marine organisms affected by availability of light
 1. oceans
 2. coral reefs
 3. estuaries

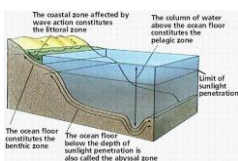
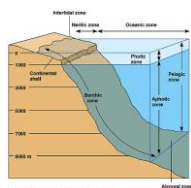
Marine

1. Oceans

- Largest of all ecosystems
- Great diversity of species
- Divided into separate zones like lakes

Ocean Zones

- **Intertidal** - where ocean meets land
 - region that is covered at high tide, but exposed at low tide
 - organisms must withstand waves
- **neritic zone** - inshore, shallow, high light
 - most organisms and species (plankton)
 - coral reefs
- **oceanic zone** - offshore, high to low light
 - less organisms that neritic
 - upper zone: protists, bacteria, plants
 - lower zone: near freezing temp.
- **pelagic zone** - water column; contains both photic and aphotic regions
- **benthic zone** - bottom surface; often rich in detritus



Marine



2. Coral Reefs

- widely distributed in warm shallow waters along continents, island, and atolls
- dominated by corals
- contain microorganisms, invertebrates, fishes, sea urchins, octopuses, and sea stars

[pictures](#)

Marine



3. Estuaries

- areas where freshwater streams or rivers merge with the ocean
- brackish (fresh/salt)
- contain algae, seaweeds, marsh grasses, and mangrove trees (only in the tropics)
- support a diverse fauna, including a variety of worms, oysters, crabs, and waterfowl.

TERRESTRIAL BIOMES

Major Land Masses

1. Tundra
2. Forest
3. Grassland
4. Desert

Characteristics of Terrestrial Biomes

BIOME	TEMP RANGE	AVG. YEARLY PRECIPITATION	SOIL	VEGETATION
TUNDRA	-36 to 12 C -15 to 54 F	< 25 cm < 10 in	Moist, thin topsoil over permafrost, low nutrients, sl. acidic	Mosses, lichens, grasses, and dwarf woody plants
TAIGA	-10 to 14 C 14 to 57 F	35-75 cm 14-30 in	Low in nutrients, highly acidic	Coniferous evergreen trees
TEMPERATE FOREST	6 to 28 C 43 to 82 F	75-125 cm 30-50 in	Moist, moderately thick topsoil, moderate nutrients	Broad leaved deciduous trees, shrubs or evergreen coniferous trees
TROPICAL FOREST	20 TO 34 C 68 to 93 F	200-400 cm 80-160 in	Moist, thin topsoil, low in nutrients	Broad leaved evergreen trees and shrubs
TEMPERATE GRASSLAND	0 to 25 C 32 to 77 F	25-75 cm 10-30 in	Deep layer of topsoil, very rich in nutrients	Dense, tall grasses in moist areas, short grasses in drier areas
SAVANNA	16 TO 34 C 61 to 93 F	75-150 30-60 in	Dry, thin topsoil, porous, low in nutrients	Tall grasses and scattered trees
CHAPPARAL	10 TO 18 C 50 to 65 F	< 25 cm < 10 in	Rocky, thin topsoil, low in nutrients	Evergreen shrubs and small trees
DESERT	7 TO 38 C 45 to 100 F	< 25 cm < 10 in	Dry, often sandy, low in nutrients	Succulent plants and scattered evergreens



1. Tundra

Arctic and Alpine

[pictures](#)

- Northernmost biome from northern N. America, Asia, and Europe
- Cold, largely treeless
- Covered by permafrost (permanently frozen layer under soil surface)
- Long cold winters
- short growing season, (~ 2 months)
- Small plants with shallow roots (grasses, mosses)
- Caribou, oxen, snowy owls, arctic foxes, lemmings, snowshoe hares
- Short summer creates swamps and bogs
- Insects, ducks, geese, cranes, waterfowl



2. Forests

- Occupy about one third of Earth's land area
- Contain about 40% of carbon in living things
- Classified by seasonality
- Types
 - Tropical
 - Temperate
 - Boreal (taiga)



• Tropical Forest

[pictures](#)

- Near the equator, only about 10% of earth land masses
- Only two seasons (rainy and dry)
- Daylight: 12 hours, little variation
- Greatest diversity of species (over 1/2 of worlds species)
- Trees compete for light- create canopy which shades floor, so very little vegetation
- Flora: tall trees, orchids, vines, ferns, mosses, palms
- Fauna: monkeys, snakes, lizards, colorful birds, insects



• Temperate Forest

[pictures](#)

- Occur in eastern North America, northeastern Asia, and western/central Europe
- Well defined seasons
- Moderate climate
- Growing season 140- 200 days
- Flora: deciduous broad leaf trees (oak, maple, hickory, etc.), coniferous trees
- Fauna: squirrels, rabbits, skunks, birds, deerm mountain lion, bobcat, wolf, fox, black bears

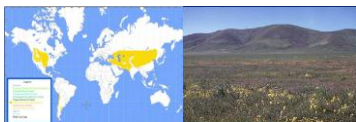


• Boreal Forest (taiga)

[pictures](#)

- Largest terrestrial biome
- Large areas of Eurasia, Siberia, Scandinavia, Alaska, and Canada
- Short moist warm summers
- Long, cold and dry winters
- Flora: cold tolerant evergreens (pine, spruce, firs)
- Fauna: woodpeckers, hawks, moose, bear, lynx, fox, wolf, deer, hares, chipmunks, bats

****extensive logging my cause their disappearance****



3. Grasslands

Dominated by grasses rather than shrubs or trees

- Asia: steppes
- North America: praries
- South America: pampas
- Africa: veldts

Main divisions

- Savannas (tropical grasslands)
- Temperate grasslands
- Chaparral



• Savanna

[pictures](#)

- Cover almost half of Africa
- Dry and rainy season, fires and thundestorms
- Seasonal fires
- Fauna: giraffes, zebras, buffaloes, kangaroos, mice, snakes, worms, termites, beetles, lions, leopards, hyenas, elephants
- Flora: grasses, small plants, scattered deciduous trees



• Temperate Grassland

[pictures](#)

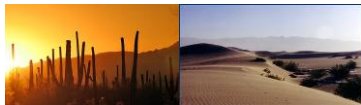
- Grasses dominant vegetation, trees and shrubs absent
- Less rain than savannas
- Hot summers and cold winters
- Seasonal draughts with fires
- Flora: purple needlegrass, buffalo grass asters, coneflowers, goldenrods, sunflowers, clovers
- Fauna: gazelles, zebras, rhinos, wild horses, lions, wolves, prarie dogs, jack rabbits, deer, coyotes, skunks, quails, sparrows, hawks, owls, snakes, insects, spiders



• Chaparral

[species](#)

- Found in middle latitudes near coastlines
- Dominated by dense spiny shrubs, scattered coniferous trees
- Mild rainy winters, hot dry summers with periodic fires
- Flora: oaks, sagebrush, olive tree, torrey pine
- Fauna: jack rabbits, wrens, jackals, foxes, pumas, skunk, wild goat



4. Deserts

- Cover about one fifth of Earth's surface
- Specialized vegetation
- Very few large mammals
- Very little shelter from sun
- Types:
 - Subtropical (hot)
 - Temperate (cold)



• Semiarid (hot and dry)

[species](#)

- Great temperature swings during day and night
- Very little rainfall, very hot in summer, warm throughout year
- Flora: adapted to dry conditions: spines rather than leaves, photosynthesis in stems, thick waxy cuticles, dense coating of hairs, extensive underground root systems, ground hugging shrubs, short woody trees (yuccas, prickly pears, mesquite, agave, brittlebush)
- Fauna: very small animals: seek shade, nocturnal lifestyle, burrows, slender bodies to shed heat, waxy body coatings, long eyelashes (insects, arachnids, reptiles, birds)



- **Temperate (cold)**

- Cold winters with snow and rain
- Located in Antarctic, Greenland, Nearctic
- Short moist moderately warm summers, long cold winters
- Flora: widely scattered, deciduous with spiny leaves
- Fauna: widely distributed (jack rabbits, kangaroo rats, kangaroo mice, pocket mice, grasshopper mice, squirrels)

