

# EFFECTS OF CLIMATIC FACTORS ON BIOTIC COMMUNITY

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# Climatic Factors

- The climatic factors are non-living factors which are responsible for determining the climatic conditions of an area.
- The climatic factors include light, temperature, humidity, precipitation, wind, fire, atmosphere etc.
- Life is found almost everywhere on Earth, but it is not distributed evenly around the planet. Different species are found in different areas; some species have overlapping ranges, others do not.
- Each species has a set of environmental conditions within which it can best survive and reproduce. Not surprisingly, those conditions are the ones for which it is best adapted.

# Temperature

- **Temperature** - the ability to withstand extremes in temperature varies widely among plants and animals
  - **Animals** respond to variation in temperature both physiologically and behaviorally. Birds and mammals are endotherms (hot-blooded) and maintain relatively high body temperatures using the heat by their own metabolism.
  - Other animals (such as reptiles, amphibians, fish, and insects) are called ectotherms and their body temperatures are largely set by the ambient (surrounding) temperature.

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- Ectotherms - use sources of heat such as solar radiation (direct and indirect) and conduction to help adjust their body temperature.
- Endotherms - may maintain body temperature by:
  - changing the position of fur or feathers
  - sweating and panting
  - shivering
  - behavioral means such as seeking shade or water, burrowing, or varying periods of activity

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- Endotherms - may avoid extended periods of low or high temperatures by hibernating or estivating.
  - Hibernation - winter dormancy
  - Estivation - summer dormancy
  - » common among some desert animals (permits conservation of water)

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- Plants** - obviously cannot move to escape high or low temperatures
  - photosynthesis slows down or stops when temperatures get too high or too low
  - at high temperatures, leaves can lose some heat by evapotranspiration (loss of water through small holes in leaves)
  - plants adapted to withstand low temperatures:
    - may have hairs on leaves or stems
    - have more solutes in cytoplasm to reduce freezing point
    - tend to be short and grow closely together to resist the cold temperatures and wind
    - tend to be dark-colored to absorb as much of the sun's heat as possible

# Water

- precipitation determines, along with mean temperature, the world-wide distribution of biomes.
- All living organisms require some amount of water. Organisms in dry ecosystems are adapted to the conditions by storing water for use over long periods or becoming less active. At the other maximum, some plants and animals only survive by being submersed in water.

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- Primary problem for plants in areas like deserts is a lack of water. Plants adapted for arid conditions include:
- Xerophytes, such as cacti and joshua trees (pictured below), that usually have special means of storing and conserving water. They often have few or no leaves, which reduces transpiration.



**Extensive roots**  
The root system  
both spreads out  
around the surface  
and has deeper  
roots that can  
stretch more than  
30 feet deep.

- Phreatophytes - plants that grow extremely long roots, allowing them to acquire moisture at or near the water table.



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- **Animals** survive in hot, dry areas by:
  - avoiding the heat, for example:
- Costa's Hummingbirds breed in desert areas of the American southwest in late winter, then leave in late spring when temperatures become extreme.
- Many animals (especially mammals and reptiles) are crepuscular (active only at dusk and dawn)
- Bats, many snakes, most rodents and some larger mammals like foxes and skunks, are nocturnal, sleeping in a cool den, cave or burrow by day.

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- dissipating heat, for example:
  - the large ears of jackrabbits (like the black-tailed jackrabbit shown to the right) have lots of blood vessels that release heat when the animal is resting in a cool, shady location
- acquiring water, for example:
  - from plants, particularly succulent ones, such as cacti. Many species of insects thrive in the deserts this way. Some insects tap plant fluids such as nectar or sap from stems, while others extract water from the plant parts they eat, such as leaves and fruit.



# Light

- Light provide energy to warm the earth's atmosphere. It influences daily and seasonal activity patterns of plants and animals.
- necessary for photosynthesis which, in turn, is the source of energy in almost all ecosystems
- Light intensity controls plant growth. Light duration affects plant flowering and animal/insect habits.
- Gross primary production = all the sun's energy that is assimilated (total photosynthesis)
- Respiration = energy needed for maintenance and reproduction
- Net primary production
  - energy remaining after respiration and stored as organic matter
  - energy available to other organisms in a food chain (or food web)

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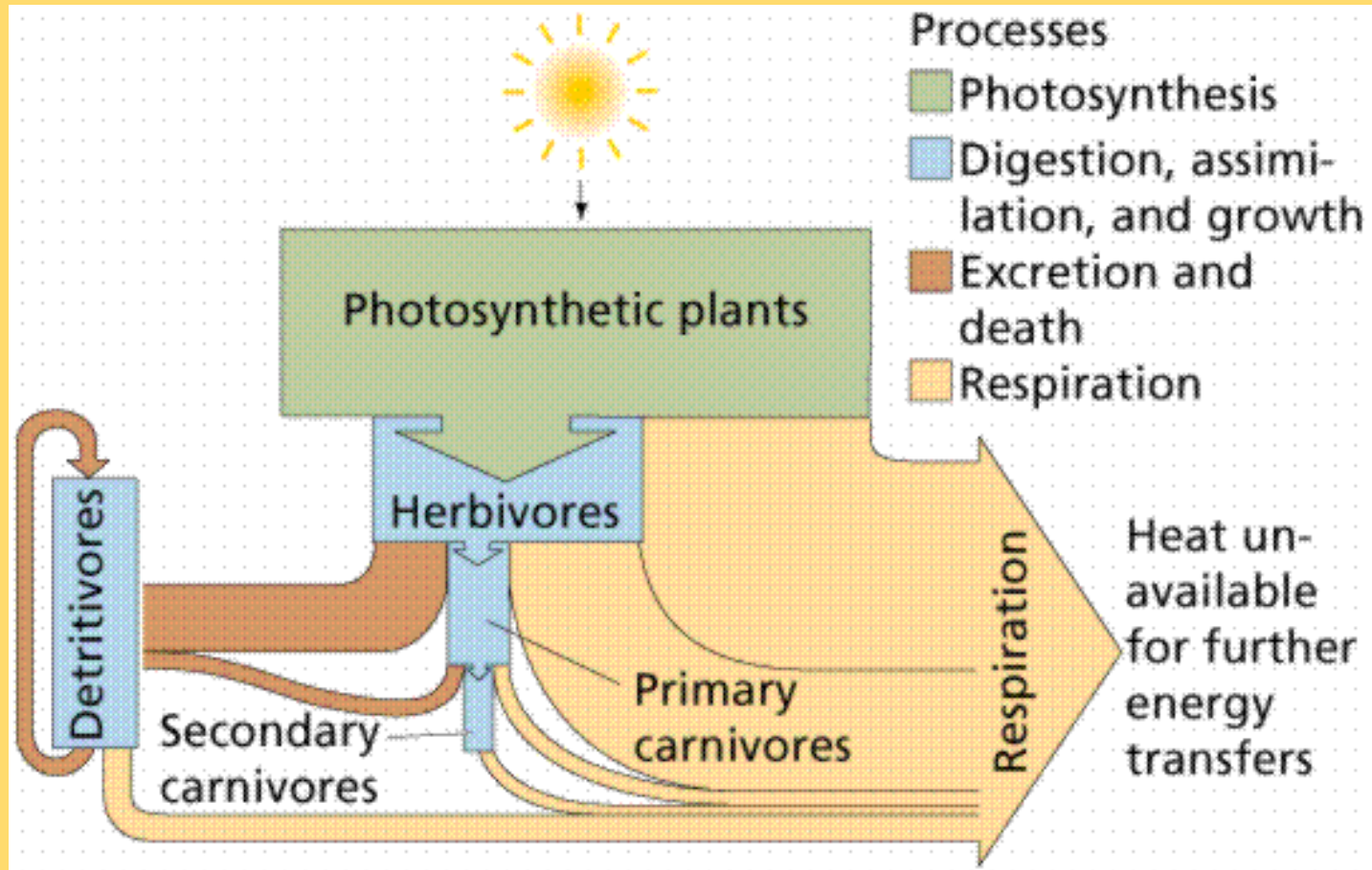


Fig.: Energy flow through an ecosystem

A close-up photograph of a hand holding a thin, light-colored branch with several vibrant green leaves. The background is a soft, out-of-focus green, suggesting a natural, outdoor setting. The lighting is bright and natural, highlighting the textures of the skin, the branch, and the leaves.

Thank You