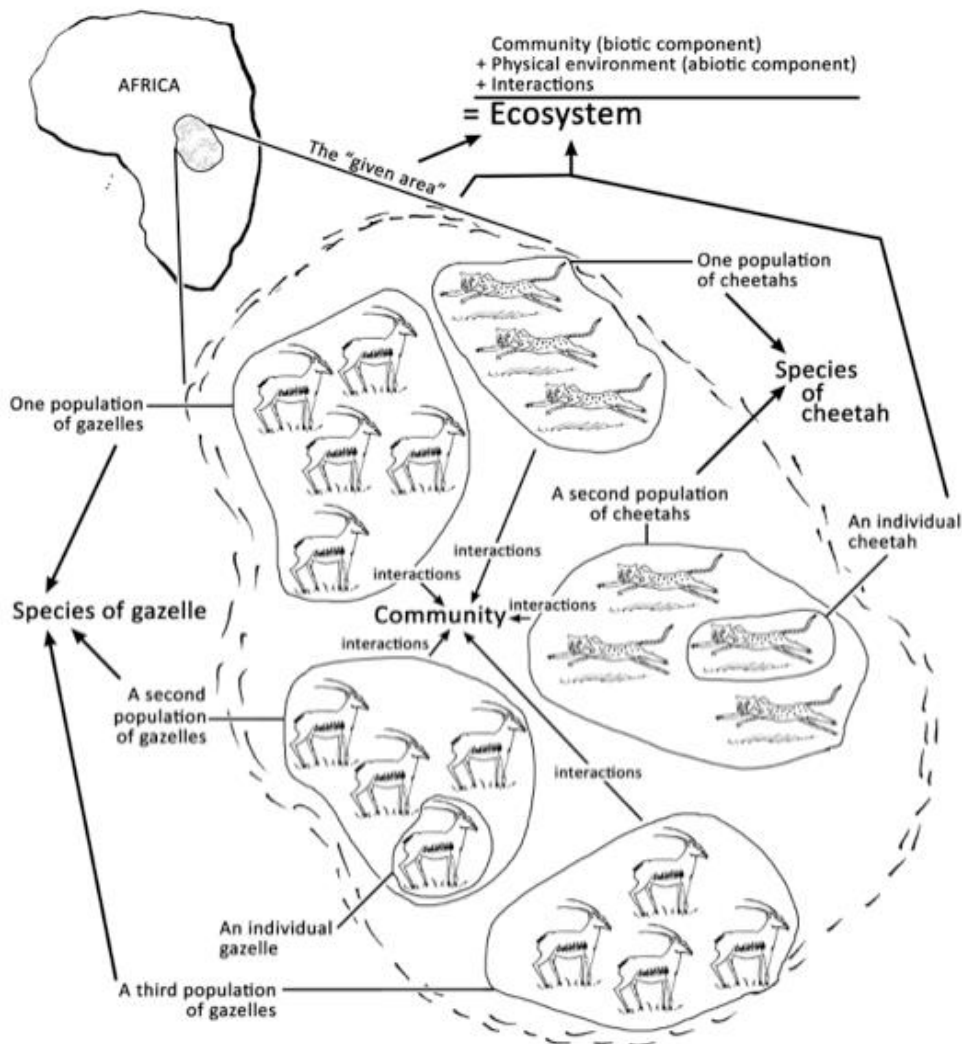


## Unit 3 Background Information: Biomes

### Biological Organization

Ecosystems can be organized into hierarchical groups. The groups include: organisms, populations, communities, ecosystems, biomes, and the biosphere. An organism is any independently living thing. Populations are groups of organisms that belong to the same species and live in the same habitat. Communities include all of the populations living in the same area. (i.e. all of the biotic factors in an area). Ecosystems are communities plus the abiotic factors in an area. Biomes are groups of ecosystems characterized by similar climate, and the biosphere encompasses all biomes on Earth.

Figure: Individual to Ecosystem

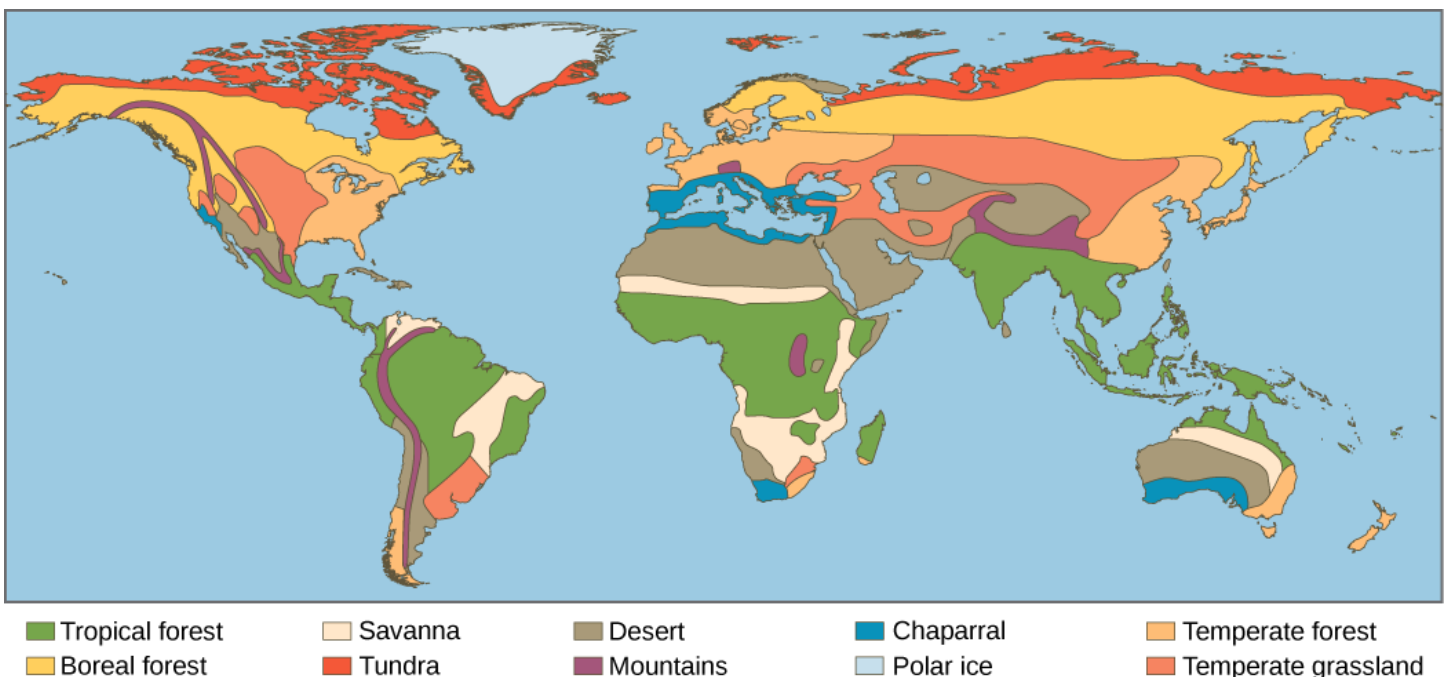


It is important to remember that these groups are not actually separated from each other in nature. Interactions and exchanges take place that connect each group to the groups above and below it. Animals migrate and currents carry materials across ecosystem boundaries. Consequently, changes in any ecosystem can have global ramifications.

## Organismal Adaptations to Conditions (Land Biomes & Biogeography)

Climatic patterns are primarily the result of Earth's orientation relative to the sun and its movement through space. The tilt of the Earth causes insolation to vary at different latitudes. Areas close to the equator receive more direct sunlight resulting in air that is warmer and capable of holding more moisture than at other latitudes. As warm air rises, water condenses and falls back to the Earth as rain producing rain forests at these latitudes and causing dry air to cycle into the atmosphere. Earth's rotation pushes dry air north and south of the equator where it continues to cool until it falls back to the Earth at 30 degrees north and south latitude. As the cool dry air descends it warms and draws moisture from the land producing deserts at these latitudes. The geology and topography of an area also play a role in determining its climate. In fact, broad climactic patterns can be overridden by local topography. For example, the climate at high elevation in the tropics may resemble the climate at much higher latitudes.

Figure: Patterns in Climate and Vegetation

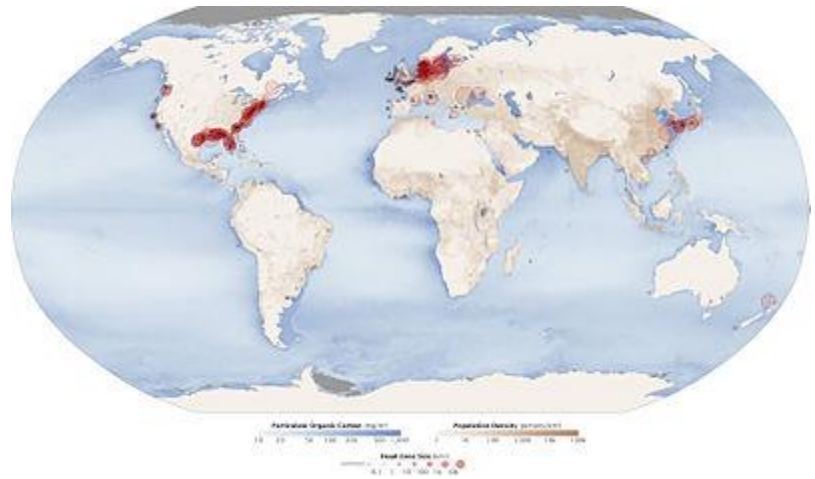


Patterns of association can be observed between organisms and the ecosystems they inhabit. For example, deserts in Africa and in North America contain organisms that have evolved similar adaptations to cope with the conditions found in that biome. Although unrelated, the *Stenocereus* cactus of Mexico and *Euphorbiaceae* cactus of Africa are both succulent, leafless plants with photosynthetic stems and similar growth patterns.

## Georgia's Aquatic Ecosystems (Aquatic Biomes)

Aquatic 'biomes' are categorized by salinity, depth and water flow. The characteristics of aquatic ecosystem are determined primarily by abiotic factors such as temperature, dissolved oxygen, pH, salinity, conductivity, turbidity, and flow. Examples of aquatic ecosystems found in Georgia include streams, rivers, ponds, lakes, wetlands, marshes, swamps, estuaries, and the open ocean.

Cultural eutrophication provides an example of how aquatic ecosystems are impacted by abiotic factors. In this process, nitrate and phosphate runoff from agricultural and residential land causes explosions of algae growth. When algae die microbes digest their remains and consume much of the dissolved oxygen in the water. This can lead to oxygen depleted zones called dead zones in which biological productivity is significantly reduced.



**Sources:**

- Khan Academy: <https://www.khanacademy.org/science/biology/ecology>
- Environmental Science for AP, Friedland and Relyea
- Essential of Ecology, Colin R. Townsend, Michael Begon & John L. Harper
- Evolution, Douglas J. Futuyma