Lecture Seven: What is an Ecosystem?

From smallest to largest, what is the organization of living things?

Subatomic particles (protons, electrons & neutrons)
Atoms
Molecules (elements & compounds)
Macromolecules (proteins, nucleic acids (DNA & RNA), lipids & carbohydrates)
Cell organelles
Cells
Tissues
Organs
Organ systems
Organism
Population
Community
**Ecosystem**
Biosphere

The ECOSYSTEM is all living communities (biotic components) and their associated non-living (abiotic components) environmental components in a defined area.

**Examples in southern Florida:**
- Everglades - a shallow wetland, or marsh
- Hammock - hardwood forest on higher ground within the Everglades
- Coral Reef
- Estuary
- Pineland

**Major Abiotic Components of Ecosystems:**
- **Temperature** - major effects on living organisms! Define the following:
  - Homeotherm -
  - Poikilotherm -
  - Endotherm -
  - Ectotherm -
- **Water** - a unique compound, it is essential to life.
- **Sunlight** - provides the energy that ultimately drives all of life’s chemical reactions
- **Wind** - Amplifies the effects of environmental temperature on organisms by increasing heat loss due to evaporation and convection ("wind chill")
- **Rocks and Soil** - physical structure, pH and mineral composition of soil limit the distribution of plants. This, in turn, affects the distribution of animals, which depend on plants for survival.
- **Periodic Disturbances** - fires, hurricanes, tornadoes, volcanic eruptions and other
occasional catastrophes can have profound effects on ecosystems, and sometimes can cause permanent change.

**CLIMATE:** temperature, water, sunlight and wind are the major components of climate, which is defined as the prevailing weather conditions (over the course of a normal year) of a particular locality.

Climate is probably the most important factor in determining the distribution of organisms, and hence the global locations of major types of ecosystems that occupy broad geographic regions. These are called **BIOMES**.

Some major terrestrial biomes are as follows:
- **Tropical Forest** (rainforest and dry forest)
- **Savanna** (tropical & subtropical grasslands)
- **Prairie** (temperate grasslands)
- **Desert**
- **Chaparral**
- **Temperate Deciduous forest** (characterized by deciduous trees)
- **Coniferous forest** (characterized by evergreens/conifers such as pines)
- **Tundra** (land of lemmings and permafrost)

Some major aquatic biomes are as follows: (and they occupy most of the biosphere!)
- **Lakes** (freshwater & brackish inland bodies of water)
- **Rivers** (running bodies of water)
- **Estuaries** (where river meets the sea: highly fertile and productive!)
- **Intertidal zones** (where land meets sea)
- **Coral Reefs** (highest species diversity, along with tropical rainforest)
- **Oceanic pelagic** (open sea; not very fertile and low in species diversity)
- **Abyssal zones** (very deep ocean regions)

Within some of these aquatic biomes, there are other interesting divisions:
- **Photic zone**: area where there's enough light for photosynthesis
- **Aphotic zone**: not enough light for photosynthesis; very dark
- **Littoral zone**: the shallow, well-lit waters close to shore
- **Limnetic zone**: well-lit waters farther away from shore
- **Benthic zone** - the solid substrate bottom of any body of water
- **Benthos** - the collective name for communities of organisms living in the benthic zone
- **Detritus** - dead, organic matter. A major food source for many organisms! (This is found on land as well as in water).

All organisms interact with one another (we'll go through this in a later lecture), and the most basic way they do this is by feeding on one another. We have defined the different levels of feeding ("trophism" - from the Greek word *troph*, meaning "to eat") by how many levels they are from the first level, plants

**PRIMARY PRODUCERS** - Organisms that can perform photosynthesis, harnessing the energy of sunlight by placing it into the chemical bonds of **sugar**, which they manufacture from water (from the soil and surroundings) and carbon dioxide (from the atmosphere).
**PRIMARY CONSUMERS** (1st) - (first trophic level) - Organisms that feed on primary producers. Also called **herbivores, frugivores** (fruit eaters), **seed eaters**, etc.

**SECONDARY CONSUMERS** (2nd) - (second trophic level) - Organisms that feed on primary consumers. These are **carnivores, insectivores**, etc.

**TERTIARY CONSUMERS** (3rd) - (third trophic level) - You guessed it.

**QUATERNARY CONSUMERS** (4th) - (fourth trophic level) You guessed it again.

**DECOMPOSERS** - digest organic molecules and break them down into their inorganic components

As you might guess, most organisms eat more than one kind of food, and a particular species isn't always eating at the same trophic level (Can you think of an example of this, even using yourself?).

This means that the trophic levels do not form a straight line, or "chain" from one level to the next. Rather, they interlace to form more of a WEB. Ecologists call these complex feeding relationships the **FOOD WEB**, and every ecosystem is characterized by a specific type of food web.

We will learn more detail about how energy flows through food webs in a later lecture. But for now, we're going to **CREATE A FOOD WEB**!