Notes

Biology 101, Fall 2007
Dr. Karen Bledsoe
http://www.wou.edu/~bledsoek/

Topic: Earth's Diverse Ecosystems **Reading:** Chapter 29

Main concepts:

- The sun, which is the ultimate source of energy in the biosphere, also drives weather cycles and ocean currents, which in turn affect climate.
- Prevailing wind direction and proximity of an area to an ocean affect local climate, since oceans tend to be heat sinks and buffer the local climate.
- The basic needs of all living things are: nutrients, energy, water, appropriate temperature.
- The distribution of living things is affected by local climate, since organisms are restricted in their geographic distribution by their needs for the basics of life.
- A biome is a large area of land characterized by particular plant communities. Large biomes contain a range of different communities distributed according to local climates and microclimates.
- Both rainfall and temperature control the locations of the world's major terrestrial biomes. In general:
  - Dry, hot = warm desert, warm grassland
  - Dry, temperate = cool desert, cool grassland (prairie, steppe), chaparral
  - Dry, cold = tundra
  - Wet, hot = tropical rain forest
  - Wet, temperate = temperate deciduous forest, temperate rain forest
  - Wet, cold = coniferous forest, taiga
- Tropical rain forests are characterized by a multi-layered tree canopy and little light on the forest floor. The soil tends to be thin and poor because organic matter decays quickly and nutrients are taken up quickly by the trees.
- Grasslands (prairie, steppe, savanna) are found in areas where there is not enough rain to support trees, but moist enough to allow a lush growth of grass. Some grasses grow deep roots to draw up moisture or to store food so that the tops may die back during dry periods.
- Deserts are areas of very low rainfall. Plants often have adaptations such as fleshy stems or leaves for storing moisture. Deserts may be cold; tundra is sometimes classified as desert, and Antarctica has areas of freezing cold desert.
- Temperate deciduous forests are found in areas of the world where summers tend to be moist and often humid and winters are cold and snowy, such as the east coast of the U.S. Trees drop their leaves and go dormant in the winter, then use stored sugars to grow new leaves in the spring.
- Temperate rain forests grow on the west coast of North America. Winters are moderate and wet, supporting year-around lush growth of trees, ferns, and moss. Summers tend to be dry.
- Coniferous forest and taiga are dominated by coniferous trees, which well-adapted to cold winters, since the needles are waxy and lose very little moisture.
- Aquatic systems also have characteristic distributions, both vertically and horizontally.
  - Littoral zones are near shore. There is abundant light and often a good supply of nutrients. Life is often very diverse in littoral zones and much less diverse in open water areas.
  - Wetlands include:
    - Marsh: freshwater systems in temperate areas, dominated by herbaceous vegetation. Marshes provide water and habitat for a wide range of aquatic and terrestrial organisms.
    - Salt marsh, or estuary: where rivers meet the sea. Estuaries are important "nurseries" for many marine species, including fish of economic value.
    - Bogs: freshwater systems in cold areas of the world. Bogs tend to be acidic, and decay is very slow.
    - Swamp: freshwater systems dominated by trees, such as mangroves, often in neotropical areas. These are habitat for a wide variety of organisms.
  - Marine ecosystems are divided into:
    - Intertidal zone: rocky shorelines are often diverse and rich, while sandy shores are a more difficult habitat due to constant shifting of the sands.
    - Near-shore zone: where there is upwelling of nutrients from the bottom, near-shore zones can be extremely productive. Coral reefs often inhabit near-shore zones and are extremely diverse.

- Open ocean (within the photic zone): can be diverse or desert-like, depending on the level of available nutrients.
- Deep ocean (aphotic): Most organisms are dependent on a constant rain of nutrient-rich particles from the photic zone. Chemosynthetic bacteria support small ecosystems around hydrothermal vents.

Common misconceptions:

- Because tropical rain forests appear so lush, people often believe the soil is deep and rich. The opposite is true, however: because things decay quickly, trees are adapted to draw nutrients out of the soil quickly. Soil tends to be thin and poor. Logging and burning of rain forests on a wide scale is extremely destructive because there is little soil to support forest re-growth.
- People often believe that clear water is a sign of a productive and healthy aquatic environment, and often work hard to keep their koi ponds or aquaria clean. However, nutrient-rich water supports a variety of algae that feed small animals or protists, which in turn support a large and complex food chain. A slightly green pond is a healthy pond. If nutrient levels are too high, however, algae can over-grow, and choke out other life, so a *very* green pond might not be healthy.
- Understanding the biome one is living in can save a lot of garden mistakes and reduce human impact on the environment. Because humans either misunderstand the effect of local climate, or choose to ignore it, we have cities in the desert (such as Phoenix or Los Angeles) where people try to grow lush green gardens. Plants that do well in an English country garden require enormous amounts of water in a desert, water that the surrounding environment may not be able to supply adequately. Gardens composed of plants native to the area are often a good alternative.

Reading notes:

- List and describe the factors that influence the earth's climates.
- List and describe the conditions required for living things on earth.
- Create a table to organize information about the terrestrial biomes. For each of the world's major biomes, list the general temperature (hot, warm, cold), rainfall (dry, moderate, high), dominant vegetation types, some of the organisms that are characteristic of the biome, and human impact that affects the biome.
- Create a table to organize information on freshwater ecosystems, including lakes, streams, and wetlands. Include information listing types of each ecosystem, characteristics, typical organisms, importance, and human impacts.
- Create a table to organize information about the ocean zones. For each zone, describe where it is located, types of organisms that live there, its productivity (high, low), and human impact on those zones.

Useful websites:

- "The Nature Conservancy" (http://www.tnc.org) is an organization that purchases and preserves endangered habitat all over the world. Their site is a good place to find specific information about the local ecology in the world's biomes.