Ecology - Biomes

Delineation of Terrestrial and Aquatic Biomes on Earth
Let us review for a moment

• **Biomes** are stable ecosystems characterized by major vegetation and animal types that exhibit particular suites of climatic attributes

• Now we will look at the various biomes
  – The distribution of these ecosystems on a global scale
  – Current status and
  – Threats to these systems
What is missing from this diagram?
Arctic Location/Climate

- North of 50° Latitude
- Major changes in day length
- Cold winters, short mild summers
- Average temp. below freezing
- Low precipitation < 15 cm/year
From a “heterogeneity” perspective, it is a rather simple system.
Arctic Structure

- Fragile vegetation
- Plant close to ground. No trees
- Bad soils, Permafrost
- Woody shrubs on well-drained soils
- Typically high winds
Alpine Tundra

- High altitude with same temp characteristics
- Main difference is variation in daylight
- Above timberline
- Cascades, Rockies, Himalayas, Kilimanjaro
Arctic & Alpine Animals

Physiologically – move, hibernate or deal with it!
Arctic Status

- Damage to permafrost
- Mineral exploration
- Oil spills & development
- Arctic National Wildlife Refuge (ANWR)
- Alpine - less exploitable
- Recreational impacts
Boreal Forest- Location/Climate

- Microthermal/Subarctic climate
- 45-75° N latitude
- Long winters, short summers
- Summer moisture
- Soils typically poor and well drained
Boreal Forest-Structure
Boreal Forest - Plant Types

- Evergreen (genera *Pinus*, *Picea*, *Abies*, *Larix*)
Boreal Forest-Animals
Boreal Forest - Status
Temperate Forest- Location/ Climate

- 20° and 50° North (generally) latitude
- 5 °C to 20 °C temperature range
- Winters cool to cold with some frost
- 50-250 cm annual ppt
- Soils tend to be relatively fertile
- Broadleaved/Mixed and Coniferous
Temperate Forest Structure

- Broadleaved/Mixed (Deciduous)
Temperate Forest - Plants
FIGURE 6.20 Eastern North American temperate forest formations (after Archibold, 1995).
Temp. Forest - Animals
Temperate Forest Structure

- Coniferous
- PNW, SW
Temp. Forest - Animals
Temp. Forests - Status

- Logging
Temp. Forests - Status

- Fire suppression
Mediterranean- Location/Climate

- Thin soil, high winter rainfall, low summer rainfall, frequent fires ("Fire-adapted" ecosystem)
- Evergreen shrubs, pines, scrub oaks, sclerophyllous leaves
- Mule deer, woodrats, chipmunks, lizards, birds are common
Mediterranean Structure
Mediterranean Plant Types
Mediterranean Animals
Mediterranean Status

Major place for agriculture, but bad erosion

Intense development for housing if water is available

Fire cycle is increasingly short

Vegetation used to be more oaks, olives, cedars, pines increasingly only shrubs
Grassland- Location/Climate

• Once prairies, now farmland (high productivity)
• Mainly grasses (bluestem, bunchgrass); no trees
• Rainfall: moderate (25-75 cm/year)
• Temperature moderate, but wide range (-30 to over 100 F)
Mixed grass steppe in Southern Russia near the Azovi Sea

A remnant of the tall-grass prairie in Kansas

Rolling plains of central Mongolia, southwest of Ulan Bator

Mixed-grass steppe in Central Hungary
Grassland Plant Types
Grassland Animals
Grassland Status

- Converted to agriculture
- Changes in fire regime
- Overgrazing by live stock
- Conversion to desert through takes on water
Desert- Location/Climate

- Lay within the Tropical Belts 15°-35° N and 15°-35° S
- Summers very hot, short winter little rainfall
- Rainfall is less than 50 cm/year
- Hot & Dry Deserts
- Cold Deserts
Desert Structure

Sparse vegetation
Desert Plant Types

e.g. cacti, creosote bush, yucca, joshua tree

few or no leaves, taproots, and thick epidermis on plants
Desert Animals

kangaroo rat, lizards, snakes, owls, vultures
nocturnal, burrowing, concentrated urine in animals

Common chameleon
(Chameleon dilepis)
Desert Status

Expansion of desert Biome
result of agriculture
overgrazing

Summer grazing damages
cryptogamic crust

Erosion

Salinization -
salts build up in irrigated soils
Savanna- Location/Climate

- Between 30° N and 30° S
- Mean monthly temperatures at or above 64° F
- In areas with distinct dry season
  - At least 5 months
  - Each with < 10 cm rainfall
Savanna-General Structure
Savanna-Plant Forms

- Would progress to seasonally dry forest but for disturbance
  - Poor soil
  - Fire
  - Grazing
- Continuous cover of perennial grasses (1-2 m tall)
- Drought-resistant and fire-resistant
- Scattered trees include: oak, pine, palm, acacia
Wet and dry season tropical deciduous vegetation in Australia
African and Australian savanna vegetation in dry season
Savanna-Animals

• World’s largest diversity of ungulates
• Many animals are herbivores
  – Antelopes, buffalo, wildebeest, zebras, rhinos, giraffes, elephants, hippos
  – Often travel in herds
• Carnivores include
  – Cats (lions, leopards, cheetahs), dogs, and hyenas
• Termites
  – Detritivores important in soil formation
  – Build large termitarias that can be used as shelter by other animals
Savanna-Current Status

- Clearing trees for firewood
- Overgrazing
  - Patches of bare ground created
  - Fire no longer carries fire across landscape
  - Invasion by trees is possible
- Poaching
TRF- Location/Climate

- Tropics: 30 N and 30 S
- Other habitat types
- Tropical rainforests
  - 10 N and 10 S
  - < 1km elevation
  - Constant temperature
  - Constant day length
  - Rainfall > 250 cm/yr
TRF-General Structure

Multilayered
- Emergent trees
- Canopy trees
- Sub-canopy
- Saplings and shrubs
- Herbaceous layer
The multi-layered canopy of tropical rainforest in Australia viewed from exterior and interior.