3-1 What Is Ecology? The study of...?

How do ecologists study ecology?
4-1 The Role of Climate

Global Climate Patterns
- Greenhouse Effect  GOOD!
- Latitude
- Transport of heat by atmospheric and ocean currents.
- Amount of precipitation
- Shape & elevation of land masses

Diagram:
- Consumer Community
- Producer Community
- Soil (Ex. Leaching)
- Climate
  1. Temp.
  2. Precipitation
The Greenhouse Effect

Good!

- CO₂ (Global warming)
- Bad!

Fossil Fuels
The Effect of Latitude on Climate

Sunlight at 90°N North Pole and 90°S South Pole: Polar

Sunlight in the region of the Arctic Circle (66.5°N) and Antarctic Circle (66.5°S): Temperate

Most direct sunlight in the Tropic of Cancer (23.5°N) and Tropic of Capricorn (23.5°S): Tropical

Sunlight at the Equator (0°): Tropical

Same amount of energy spread over a larger area.
The Effect of the Earth's Tilt on Climate

Seasons!
Heat Transport in the Biosphere

Wind results from the uneven heating of the earth's surface.

Convection currents transport heat from equator to poles.
OCEAN CURRENTS

Heat Transport in the Biosphere

66.5°N
23.5°N
0°
23.5°S
66.5°S

Warm currents
Cold currents

Surface
Deep

Summary of all currents...
The Great Ocean Conveyor keeps the north warmer
No two species can occupy the exact same niche. One will always be excluded. This results in dividing the niche among species.
Symbiotic Interactions (Coevolution)

Two species in close interaction.

Commensalism +

E. coli

Mutualism ++
(Most)

Parasitism +

Predator-Prey
Ecological Succession

1. Ex. Volcanic Eruption
   Primary (rock) Succession
   Soil

2. Time
   Pioneer Species

3. Lichens (Fungi + Algae)
   Mosses, Grasses, and Herbs

4. Climax Community
   Ex. Temperate Forest

Secondary Succession begins with soil. (Ex. Old Field) Fire

Trees + Shrubs
(a) What begins as a lake gradually fills with organic and inorganic sediments, which successively shrink the area of the pond. A bog forms, then a marshy area, and finally a meadow completes the successional stages. (b) Aquatic succession in a mountain lake. [Photo by Bobbé Christopherson]
Ecological Succession

"Carcass" Succession

COLLECTING INSECTS FOR FORENSIC INVESTIGATIONS

- EQUIPMENT
  1. Rake
  2. Histograms
  3. Vials
  4. Nets
  5. Detectors
- SUPPORTING DATA SHEET
  1. Precise location data
  2. Marking and identification
  3. Weather conditions
  4. Depth and size of excavation

- SAMPLES
  - FLIES
    - MAMELIS
    - ECTOTHPARASITES
  - BEETLES
    - BEETLES
    - BEETLES
- LABELS
  - JAR LABEL
  - SPECIMEN JAR LABEL

- REMARKS
  - MAGGOTS CONCENTRATED IN HEAD OR DEEP MUSCLES FIRST, ASO OF DEEPER PARTS OF BURIAL
The Major Biomes (climate, soil, community)

- Tropical rain forest
- Tropical dry forest
- Tropical savanna
- Tundra
- Temperate grassland
- Desert
- Temperate woodland and shrubland
- Mountains and ice caps
- Temperate forest
- Northwestern coniferous forest
- Boreal forest (Taiga)
Climatogram

New Orleans, Louisiana

Average Temperature (°C)

Average Precipitation (mm)

Month

J  F  M  A  M  J  J  A  S  O  N  D
Biomes and Climate

In regions having the ranges indicated within the red dashed lines, other factors—such as seasonality of drought, fire, and grazing—strongly affect which biome is present.

Coldest & Dryest

Warmest & Wettest
2. Central Park
3. Desert Oasis
4. Under a Rock
5. Hollow Log
**Abiotic factors:** hot and wet year-round; thin, nutrient-poor soils \((\text{Leaching})\)

**Dominant plants:** broad-leaved evergreen trees; ferns; large woody vines and climbing plants; orchids and bromeliads

**Dominant wildlife:** herbivores such as sloths, tapirs, and capybaras; predators such as jaguars; anteaters; monkeys; birds such as toucans, parrots, and parakeets; insects such as butterflies, ants, and beetles; piranhas and other freshwater fishes; reptiles such as caymans, boa constrictors, and anacondas

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**Abiotic factors:** generally warm year-round; alternating wet and dry seasons; rich soils subject to erosion

**Dominant plants:** tall, deciduous trees that form a dense canopy during the wet season; drought-tolerant orchids and bromeliads; aloe and other succulents

**Dominant wildlife:** tigers; monkeys; herbivores such as elephants, Indian rhinoceroses, hog deer; birds such as great pied hornbills, pied harriers, and spot-billed pelicans; insects such as termites; reptiles such as snakes and monitor lizards
**Tropical savanna**

**Abiotic factors:** warm temperatures; **seasonal rainfall**; compact soil; frequent fires set by lightning

**Dominant plants:** tall, **perennial** grasses; sometimes drought-tolerant and fire-resistant trees or shrubs

**Dominant wildlife:** predators such as lions, leopards, cheetahs, hyenas, and jackals; aardvarks; herbivores such as elephants, giraffes, antelopes, and zebras; baboons; birds such as eagles, ostriches, weaver birds, and storks; insects such as termites

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**Temperate grassland**

**Abiotic factors:** warm to hot summers; **cold winters**; moderate, **seasonal precipitation**; fertile soils; occasional fires

**Dominant plants:** lush, perennial grasses and herbs; most are resistant to drought, fire, and cold

**Dominant wildlife:** predators such as coyotes and badgers—historically included wolves and grizzly bears; herbivores such as mule deer, pronghorn antelopes, rabbits, prairie dogs, and introduced cattle—historically included bison; birds such as hawks, owls, bobwhites, prairie chickens, mountain plovers; reptiles such as snakes; insects such as ants and grasshoppers
**Temperate forest**

**Abiotic factors:** cold to moderate winters; warm summers; year-round precipitation; fertile soils

**Dominant plants:** broadleaf deciduous trees; some conifers; flowering shrubs; herbs; a ground layer of mosses and ferns

**Dominant wildlife:** Deer; black bears; bobcats; nut and acorn feeders such as squirrels; omnivores such as raccoons and skunks; numerous songbirds; turkeys

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**Temperate woodland and shrubland**

**Abiotic factors:** hot, dry summers; cool, moist winters; thin, nutrient-poor soils; periodic fires

**Dominant plants:** woody evergreen shrubs with small, leathery leaves; fragrant, oily herbs that grow during winter and die in summer

**Dominant wildlife:** predators such as coyotes, foxes, bobcats, and mountain lions; herbivores such as blacktailed deer, rabbits, and squirrels; birds such as hawks, California quails, warblers and other songbirds; reptiles such as lizards and snakes; butterflies
Northwestern coniferous forest

Abiotic factors: mild temperatures; abundant precipitation during fall, winter, and spring; relatively cool, dry summer; rocky, acidic soils

Dominant plants: Douglas fir, Sitka spruce, western hemlock, redwood Conifers

Dominant wildlife: bears; large herbivores such as elk and deer; beavers; predators such as owls, bobcats, and members of the weasel family

Abiotic factors: long, cold winters; short, mild summers; moderate precipitation; high humidity; acidic, nutrient-poor soils

Dominant plants: needleleaf coniferous trees such as spruce and fir; some broadleaf deciduous trees; small, berry-bearing shrubs

Dominant wildlife: predators such as lynxes and timber wolves and members of the weasel family; small herbivorous mammals; moose and other large herbivores; beavers; songbirds and migratory birds
**Tundra**

**Abiotic factors:** strong winds; low precipitation; short and soggy summers; long, cold, and dark winters; poorly developed soils: **permafrost**

**Dominant plants:** ground-hugging plants such as mosses, lichens, sedges, and short grasses

**Dominant wildlife:** a few resident birds and mammals that can withstand the harsh conditions; migratory waterfowl, shore birds, musk ox, Arctic foxes, and caribou; lemmings and other small rodents

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**Desert**

**Abiotic factors:** low precipitation (<25cm/yr); variable temperatures; soils rich in minerals but poor in organic material

**Dominant plants:** cacti and other succulents; creosote bush and other plants with short growth cycles

**Dominant wildlife:** predators such as mountain lions, gray foxes, and bobcats; herbivores such as mule deer, pronghorn antelopes, desert bighorn sheep, and kangaroo rats; bats; birds such as owls, hawks, and roadrunners; insects such as ants, beetles, butterflies, flies, and wasps; reptiles such as tortoises, rattlesnakes, and lizards
Mountains and ice caps (Polar)

Mountain ranges can be found on all continents. On mountains the abiotic and biotic conditions vary with elevation. As you move up from base to summit, the climate changes. Therefore, the types of plants and animals also change. If you were to climb the Rocky Mountains in Colorado, for example, you would begin in a grassland. Then, an open woodland of pines. Next, a forest of spruce and other conifers. Near the summit, open areas of wildflowers and stunted vegetation resembling tundra. Finally, ice fields occur at the peaks of some ranges resembling polar regions.

The icy polar regions that border north of the tundra are cold year-round. Plants and algae are few but do include mosses and lichens. In the north polar region, the Arctic Ocean is covered with sea ice, and a thick ice cap covers most of Greenland. Polar bears, seals, insects, and mites are the dominant animals. In the south polar region, the continent of Antarctica is covered by a layer of ice that is nearly 5 kilometers thick in some places. There, the dominant wildlife includes penguins and marine mammals.
Climate Change

What appears to be the cause and effect relationship in this series of data?

What effect do you think this will have on the distribution of biomes and species survival on Earth? What does this have to do with species tolerance?

Remind us to come back to this when we discuss population.