Honors Biology – Unit 5 – Chapter 36
"POPULATION ECOLOGY"

1. 13 levels of organization in biology

2. 4 dispersion patterns: clumped, uniform, random, gradient

3. population growth curves:

    - 3 phases of growth
    - carrying capacity
    - exponential growth vs. logistic growth

4. limiting factors: biotic vs. abiotic factors

5. R-selected species vs. K-selected species

6. human population growth

Honors Biology – Unit 5 – Chapter 37
"COMMUNITIES AND ECOSYSTEMS"

1. co-evolution (+/+ or +/–)

2. parasitism (+/–)

3. commensalism (+/+)

4. mutualism (+/+)

5. competition (usually –/– sometimes +/–)

6. predation (+/–)

7. invasive species:

    - rabbits
    - tumbleweed

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"CONSERVATION BIOLOGY"

1. threats to biodiversity:

    - habitat destruction
    - invasive species
    - overexploitation

2. biomagnification of DDT

3. air pollution:

    - smoke and fog → smog
    - sulfur gases → acid rain
    - CO_2 → global warming
    - CFC's → ozone depletion

4. water pollution:

    - chemical contamination
    - sewage contamination
    - thermal pollution
    - ocean pollution
    - oil spills

5. human population growth curve, lack of carrying capacity

Honors Biology – Chapter 36 Word Roots
"POPULATION ECOLOGY"

demo- = people; **-graphy** = writing (*demography:* the study of human populations; *demographic transition:* the shift from zero population growth characterized by high birth and death rates to zero population growth characterized by low birth and death rates)

capit- = head (*per capita rate of increase:* the average contribution of each individual [literally, each "head"] in a population to population growth)

Honors Biology – Chapter 37 Word Roots
"COMMUNITIES AND ECOSYSTEMS"

inter- = between (*interspecific interactions:* interactions between organisms of different species; *interspecific competition:* competition between individuals or populations of two or more species for a limited resource)

mutu- = reciprocal (*mutualism:* an interspecific relationship in which both partners benefit)

Honors Biology – Chapter 38 Word Roots
"CONSERVATION BIOLOGY"

bio- = life (*biodiversity:* the variety of living things, encompassing genetic diversity, species diversity, and ecosystem diversity; *biodiversity crisis:* the current rapid decline in the variety of life on Earth, due largely to the effects of human activity; *biodiversity hot spot:* a small geographic area with an exceptional concentration of endangered and threatened species, especially endemic species; *biological magnification:* the process by which the residual concentration of a substance increases in the tissues of consumers as it travels up the food chain)

end- = within (*endemic species:* a species whose distribution is limited to a specific geographic area)

pheno- = appear (*phenotypic plasticity*: an individual's ability to change phenotype in response to local environmental conditions)

PROPERTY OF:

HONORS BIOLOGY – UNIT 5 – CHAPTERS 36 & 37 NOTES

POPULATIONS & COMMUNITIES

Levels of Organization in Biology

13. ** Biosphere = all living things on Earth
12. ** Ecosystem = all the communities in a large area; includes biotic and abiotic factors
11. ** Community = group of all the different species in an area
10. ** Population = group of organisms of the same species in an area
9. ** Organism = one individual organism
8. Organ System
7. Organ
6. Tissue
5. Cell
4. Organelle
3. Molecule
2. Atom
1. Subatomic Particle

Dispersion

Dispersion = a pattern of how organisms are located

EX. 1: CLUMPED = the organisms are found in distinct areas or patches
EX. 2: UNIFORM = the organisms are evenly spread out throughout an area
EX. 3: RANDOM = there is no pattern to how the organisms are found
EX. 4: GRADIENT = most of the organisms are located near something;
there are fewer and fewer organisms are you move farther away

Population Growth
- Most populations grow according to 3 distinct phases:
    1. slow period of growth at the beginning
    2. intense (fast) period of growth
    3. growth slows down and the population size evens out (carrying capacity)
- The population growth curve is also called an "S-shaped curve" or an "S-curve".

Carrying Capacity
- carrying capacity = the maximum number of organisms an environment can support
- Carrying capacity is determined by the various limiting factors.
- Carrying capacity occurs when the birth rate equals the death rate.

- EXPONENTIAL GROWTH = phases 1 and 2
  referred to as "R-selected"
  population has not reached carrying capacity yet
  the birth rate is greater than the death rate

- LOGISTIC GROWTH = phase 3
  referred to as "K-selected"
  population has reached carrying capacity
  the birth rate and the death rate are equal

Limiting Factors
- limiting factors = factors that limit population size
- Limiting factors prevent the population of a species from increasing beyond what the environment can support.
- 2 types of limiting factors: biotic factors and abiotic factors

Biotic Limiting Factors
- any factor that is affected by the # of organisms in the population
- also called density-dependent factors; determined by the density of the population
- referred to as living factors

EX: competition = fighting for food, shelter, water, mates, territory, light, etc.
EX: predation = when one animal eats another; predator-prey; food chain
EX: parasitism = when an organism feeds off of a host; diseases
EX: crowding = not enough space for all the organisms

Abiotic Limiting Factors
- any factor that is NOT affect by the # of organisms in the population
- also called density-independent factors; not determined by the density of the population
- referred to as non-living factors

EX: drought, tornado, earthquake, tsunami, volcano, hurricane, cold weather, forest fire, etc.
anything that is not caused by the # of organisms

R-Selected Species	K-Selected Species
exponential growth	logistic growth
early age of reproduction	later age of reproduction
reproduce often	reproduce infrequently
many offspring at a time	few offspring at a time
smaller offspring	larger offspring
short generation time	long generation time
little parental care	lots of parental care
pioneer species	climax community
has not reached carrying capacity	has reached carrying capacity

Species Interactions

A. Co-Evolution = when species evolve in response to each other (+/+ or +/–)
   - EX. 1: tough leaves & herbivores
   - EX. 2: rose stems & herbivores
   - EX. 3: flowering plants & insects
   - EX. 4: Rafflesia & flies
   - EX. 5: poison ivy & herbivores

B. Symbiosis = a close, long-term relationship between 2 or more different species

   1. Parasitism = when one organism lives or feeds off of another organism (+/–)
      - EX. 1: tapeworm & human intestines
      - EX. 2: HIV & T-cell (immune system – white blood cell)

   2. Commensalism = when one organism greatly benefits, but the other is not affected (+/0)
      - EX. 1: barnacles & gray whale
      - EX. 2: shrimp & sea anemone

   3. Mutualism = when all participating species benefit (+/+)
      - EX. 1: E. Coli & human intestines
      - EX. 2: fungi & algae

C. Competition = when organisms fight over a specific resource or limiting factor (-/- or +/-)
   - EX. 1: two female peacocks trying to attract the male peacock
   - EX. 2: two dogs fighting over food or territory

D. Predation = when one animal eats another animal; the predator-prey relationship (+/–)
   - EX. 1: a bird flies down and eats a worm
   - EX. 2: a shark eats a fish

PROPERTY OF:

HONORS BIOLOGY – UNIT 5 – CHAPTER 38 NOTES

CONSERVATION BIOLOGY

Air Pollution

1. SMOG
   - Cause: smoke and fog; smoke produced by factories
   - Effect: dark, cloudy skies – especially near big cities (EX: Los Angeles)
2. ACID RAIN
   - Cause: sulfur gases released by the burning of fossil fuels (EX: gas, oil, coal, etc.)
     The sulfur gases combine with H_2O to form sulfuric acid in the atmosphere.
   - Effect: plant roots are not able to absorb nutrients
     plants die, creating a major problem for the food chain
3. GLOBAL WARMING
   - Cause: carbon dioxide released by the burning of fossil fuels
   - Effect: the extra carbon dioxide in the atmosphere contributes to the greenhouse effect
     extra heat is trapped in the atmosphere → ice caps melt → sea levels rise
4. OZONE DEPLETION
   - Cause: chlorofluorocarbons (CFC's) found in aerosol cans and other household items
   - Effect: CFC's destroy the ozone layer, which is used to absorb the sun's UV radiation
     Increased rate of skin cancer

Water Pollution

1. Chemical Contamination = chemicals are dumped into the water
2. Sewage Contamination = human waste is dumped into the water
3. Thermal Pollution = factories dump hot water into the water
4. Ocean Pollution = garbage and other trash are dumped into the water
5. Oil Spills = when oil is accidentally dumped into the water (EX: Gulf Coast - 2010)

Biological Magnification

- when a toxic, fat-soluble chemical accumulates in the soil, it makes its way up the food chain, becoming more concentrated (higher amounts) at each increasing trophic level
- Fat-soluble toxins cannot be excreted through the urine, so they remain in the fat tissue.
- Unlike the 10% rule, fat-soluble toxins increase in concentration at each trophic level.
- EX: DDT (dichlorodiphenyltrichloroethane), a banned pesticide

Human Population Growth

- The human population has grown so rapidly in the past couple of hundred years.
- We have not reached carrying capacity yet.
- We are still experiencing exponential growth.
- Eventually we will run out of resources (limiting factors), and the population will stabilize.