

**REVIEW UNIT 1: ECOLOGY — “TOP TEN” Chapters 51-56**  
**Top “10” — Key concepts from this unit**

**AP Biology**

**Populations**

- group of individuals of same species living in same area (size, density, distribution/dispersion)
- habitat (type of area organism lives) vs. niche (role in ecosystem)
- competition
  
- survivorship curves
  - Type 1 = most live long life = K-selected = humans, large mammals
  - Type 2 = constant death rate = hydra, small mammals
  - Type 3 = most die young = r-selected opportunists = fish, shellfish
  
- age structure (rapid growth vs. declining vs. stable populations)
  
- population growth
  - biotic potential (max. growth rate under ideal conditions)
    - age at reproductive maturity, clutch size, frequency of reproduction, reproductive
  - lifetime, survivorship of offspring
    - bacteria vs. elephant
  - limiting factors
    - density dependent (competition for resources, parasites & diseases, waste products, stress, predation)
    - density independent (climate = temperature & rainfall, natural disaster)
  - exponential growth (J-shaped, unlimited) vs. logistic growth curve (S-shaped, limited)
  - carrying capacity = maximum population supported by habitat
  - population cycles
  
- human population growth
  - exponential = habitat expansion, increase in food supply, advances in medicine, waste treatment reduces hazard

**Communities**

- interaction of populations
- interspecific competition
  - competitive exclusion principle
    - no two species can occupy same niche; one outcompetes the other and the second is eliminated (Paramecium, barnacles)
  - resource partitioning
    - species seemingly coexist in same area, but actually occupying slightly different niches (arboreal lizards)
  - character displacement
    - selection of adaptations that reduce competition (finches beaks)
  - keystone species
    - important regulating effect on community, maintains diversity (sea otters & orcas)
  - symbiosis = species interaction
    - mutualism +/+ (acacia tree & ants; lichens, N-fixing bacteria & legume plants)
    - commensalism +/- (egrets & cattle)

- parasitism +/- (tapeworm, cowbird) = parasite vs. parasitoid
- predation +/- (carnivores & herbivores)
- competition -/- (interspecific vs. intraspecific)

#### ➤ coevolution

- defense mechanisms
  - camouflage (cryptic coloration)
  - warning coloration (aposematic coloration)
  - mimicry
    - Batesian = harmless copies harmful
    - Mullerian = warning both are harmful (aposematic)
  - secondary compounds in plants to defend herbivore predation
- flower color & structure to promote insect & mammal pollination

#### ➤ ecological succession

- predictable change in composition of species in community over time
- pioneer species (lichens, grasses = opportunistic r-selected) → shrubs (stable Kselected) → small trees → large trees / climax community
- primary (on rock, lava, sand dunes) vs. secondary (old field succession on cropland, stagnant lake succession)

### **Ecosystems**

- Energy flow/production = energy flows through; 90% lost at each level & 10% transferred to next level
  - trophic levels = primary producers, primary consumers, secondary consumers, tertiary consumers, detritivores & decomposers
  - ecological pyramids (pyramids of energy, biomass, numbers)
  - food chains & food webs
- Nutrient cycles = flow of essential elements from environmental pool through food web & recycled back by decomposers
  - cycles: water, carbon, nitrogen, phosphorus

### **Biomes**

- Tropical rainforest, savanna, temperate grassland, temperate deciduous forest, desert, taiga, tundra, freshwater, marine

### **Human impact**

- greenhouse effect / global warming
- ozone depletion
- acid rain
- pollution (air, water, land)
  - biomagnification
  - eutrophication
- desertification
- deforestation
- loss of species diversity

## **Animal Behavior**

- Nobel prize winner ethologists
  - Karl von Frisch – honeybee communication (waggle dance)
  - Niko Tinbergen – fixed action pattern description
  - Konrad Lorenz – imprinting behaviors in migratory geese
- Fixed action pattern – innate behavior, continuous to completion, initiated by sign stimuli
- Learning
  - Habituation -
  - Associative learning – a stimulus is linked to a behavior
    - Classical conditioning (Pavlov)
    - Operant conditioning (Skinner)
- Imprinting
  - Critical period in development, irreversible
  - Parent-offspring bonding
- Social Behavior
  - Cooperation
  - Agonistic
  - Dominance hierarchies
  - Territoriality
  - Altruism

## **Dissolved Oxygen Lab**

- Be sure to review the procedures and the conclusions, and understand:
  - how to measure primary productivity (photosynthesis)
  - measure rate of CO<sub>2</sub> consumption
  - measure oxygen production
  - measure biomass production
- factors that affect dissolved oxygen
  - temperature = ↑ temp = ↓ dissolved O<sub>2</sub>
  - photosynthesis = bright light = ↑ dissolved O<sub>2</sub>
  - decomposition = ↑ microbial respiration = consumes O<sub>2</sub>
  - turbulence = ↑ dissolved O<sub>2</sub>
- difference between gross productivity & net productivity
  - gross productivity = how much CO<sub>2</sub> fixed from air into sugars
  - net productivity = gross productivity (bottle in light) – respiration (bottle in dark)