

REVIEW UNIT 10: ECOLOGY — “TOP TEN”**A. Top “10” — If you learned anything from this unit, you should have learned:**

1. 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
- a. 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
- b. age structure (rapid growth vs. declining vs. stable populations)
- c. 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
- d. human population growth
 - exponential = habitat expansion, increase in food supply, advances in medicine, waste treatment reduces hazard

2. Communities

- interaction of populations
- a. 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)
- b. symbiosis = species interaction
- mutualism $+/+$ (acacia tree & ants; lichens, N-fixing bacteria & legume plants)
 - commensalism $+/0$ (egrets & cattle)
 - parasitism $+/-$ (tapeworm, cowbird) = parasite vs. parasitoid
 - predation $+/-$ (carnivores & herbivores)
 - competition $-/-$ (interspecific vs. intraspecific)
- c. 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
- d. ecological succession
- predictable change in composition of species in community over time
 - pioneer species (lichens, grasses = opportunistic r-selected) → shrubs (stable K-selected) → small trees → large trees / climax community
 - primary (on rock, lava, sand dunes) vs. secondary (old field succession on cropland, stagnant lake succession)
3. Ecosystems
- a. 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

- b. Nutrient cycles = flow of essential elements from environmental pool through food web & recycled back by decomposers
 - cycles: water, carbon, nitrogen, phosphorus
- 4. Biomes: tropical rainforest, savanna, temperate grassland, temperate deciduous forest, desert, taiga, tundra, freshwater, marine
- 5. Human impact
 - a. greenhouse effect / global warming
 - b. ozone depletion
 - c. acid rain
 - d. pollution (air, water, land)
 - biomagnification
 - eutrophication
 - e. desertification
 - f. deforestation
 - g. loss of species diversity

B. Labs

1. Dissolved Oxygen Lab

Be sure to review the procedures and the conclusions, and understand:

- a. how to measure primary productivity (photosynthesis)
 - measure rate of CO₂ consumption
 - measure oxygen production
 - measure biomass production
- b. factors that affect dissolved oxygen
 - temperature = ↑ temp = ↓ dissolved O₂
 - photosynthesis = bright light = ↑ dissolved O₂
 - decomposition = ↑ microbial respiration = consumes O₂
 - turbulence = ↑ dissolved O₂
- c. difference between gross productivity & net productivity
 - gross productivity = how much CO₂ fixed from air into sugars
 - net productivity = gross productivity (bottle in light) – respiration (bottle in dark)