**CONCEPT 8 – ECOLOGY**

1. Populations
2. group of individuals of same species living in same area (size, density, distribution/dispersion)
3. habitat (type of area organism lives) vs. niche (role in ecosystem)
4. competition for resources
5. age structure (rapid growth vs. declining vs. stable populations)
6. population growth
7. density dependent limiting factors (competition for resources, parasites & diseases, waste products, stress, predation)
8. density independent limiting factors (climate = temperature & rainfall, natural disaster)
9. exponential growth (J-shaped, unlimited) vs. logistic growth curve (S-shaped, limited)
10. carrying capacity = maximum population supported by habitat
11. populations can cycle
12. Population ability to respond to changes in the environment is affected by genetic diversity. Species and populations with little genetic diversity are at risk for extinction.
13. Communities
14. measured and described in terms of species composition and species diversity
15. symbiosis = species interaction
16. mutualism +/+ (acacia tree & ants; lichens, N-fixing bacteria & legume plants)
17. commensalism +/0 (egrets & cattle)
18. parasitism +/– (tapeworm, cowbird)
19. predation +/– (carnivores & herbivores)
20. competition
21. Ecosystems
22. Free Energy
23. Reproduction and rearing of offspring require free energy beyond that used for maintenance and growth. Different organisms use various reproductive strategies in response to energy availability.
24. There is a relationship between metabolic rate per unit body mass and the size of multicellular organisms — generally, the smaller the organism, the higher the metabolic rate.
25. Excess acquired free energy versus required free energy expenditure results in energy storage or growth.
26. Insufficient acquired free energy versus required free energy expenditure results in loss of mass and, ultimately, the death of an organism.
27. Energy flow/production = energy flows through; 90% lost at each level & 10% transferred to next level
28. trophic levels = primary producers, primary consumers, secondary consumers, tertiary consumers, detritivores & decomposer
29. ecological pyramids (pyramids of energy, biomass, numbers)
30. food chains & food webs
31. Biotic and Abiotic factors can both cause disruption and collapse of ecosystems

***Vocabulary***

Apex predator

Biomagnification

Biomass

Carrying capacity

Carnivore

Commensalism

Competition

Consumer

Density-dependent

Density-independent

Decomposer

Detrivore

Energy pyramid

Exponential growth

Food chain

Food web

Herbivore

Heterotroph

Logistic growth

Mutualism

Trophic level

Parasitism

Population

Predation

Primary productivity

Producer

***Thinking Questions***

1. Invasive species are species that are introduced into an environment but are not naturally found in that environment. One example of an invasive species is the American gray squirrel, introduced into Britain at the end of the 18th century. Until 1876 the only native squirrel in Britain was the European red squirrel, which was found in deciduous and coniferous forests. By 1940 the gray squirrel had displaced the red squirrel across most of the British Isles, and by 1984 the red squirrel was only found in isolated coniferous woodland areas. After its initial introduction, the gray squirrel population increased rapidly; however, in recent years population sizes within specific environments have become stable.
2. Explain why the newly-introduced gray squirrel initially showed rapid population growth and why the native red squirrel showed a population decline.
3. Why has the population size of the gray squirrel become stable in recent years?
4. The first age structure graph below for country X shows the percent of the population in each age group for the year 2000. The remaining three graphs are projections of how the age structure of country X will change. From these age structure diagrams construct a graph of population size vs. time for 2000-2080 and justify your prediction.



1. The graphs below display the growth rate for two species of bacteria when grown separately and together.



1. The population growth of which bacteria is more affected by growing conditions? Explain how you know.
2. Using the information provided in the graphs, make a prediction as to why the bacteria identified in part a is more affected by growing conditions than the other bacteria.
3. Interdependence in nature is illustrated by the transfer of energy through trophic levels. The diagram below depicts the transfer of energy in a food web of an Arctic lake located in Alaska.



1. Identify an organism from each of the 5 trophic levels (producer, primary consumer, secondary consumer, teritiary consumer and decomposer) and explain how energy is obtained at each level.
2. Describe the efficiency of energy transfer between trophic levels of this food web.
3. Explain how the amount of energy available at each trophic level affects the size of each population.
4. If the cells in the dead terrestrial plant material that washed into the lake contained a commercially produced toxin, what would be the likely effects of this toxin on this food web? Explain.
5. If all of the Sculpin in this ecosystem were removed, predict how it would impact the following and explain each prediction:
* The population of lake trout
* The population of snails
* The population of algae
* The amount of oxygen produced in the ecosystem
* The amount of light energy absorbed by the ecosystem

**Ecology Long Free Response (10 points)**

