General Outcome 2

Students will explain the interaction of individuals in a population with one another and with members of other populations.

Specific Outcomes for Knowledge

Students will:

30-D2.1k describe the basis of species interactions and symbiotic relationships and describe the influence of these interactions on population changes; i.e.,

- predator-prey and producer-consumer relationships
- symbiotic relationships: commensalism, mutualism and parasitism
- interspecific and intraspecific competition

30-D2.2k explain the role of defence mechanisms in predation and competition; *e.g., mimicry, protective coloration, toxins, behaviour*

30-D2.3k explain how mixtures of populations that define communities may change over time or remain as a climax community; i.e., primary succession, secondary succession.

General Outcome 3

Students will explain, in quantitative terms, the change in populations over time.

Specific Outcomes for Knowledge

Students will:

30-D3.1k describe and explain, quantitatively, factors that influence population growth; i.e.,

- mortality, natality, immigration, emigration
- change in population size, ΔN = [natality + immigration] - [mortality + emigration]

30-D3.2k describe the growth of populations in terms of the mathematical relationship among carrying capacity, biotic potential, environmental resistance and the number of individuals in the population; i.e.,

- growth rate, $gr = \frac{\Delta N}{\Delta t}$, where ΔN is the change in number of individuals in a population and Δt is change in time
- per capita growth rate, $cgr = \frac{\Delta N}{N}$, where ΔN is the change in number of individuals in a population relative to N, the original number of individuals
- population density, $D_p = \frac{N}{A}$, or $D_p = \frac{N}{V}$, where N is the number of individuals in a given space, A is the area, and V is the volume

30-D3.3k explain the different population growth patterns; i.e.,

- logistic growth pattern (S-shaped curve) and exponential growth pattern (J-shaped curve)
- open and closed populations

30-D3.4k describe the characteristics and reproductive strategies of r-selected and K-selected organisms.

Pre-Class Reading Assignments

Topic 1 - Population Size and Density and Growth
Read pgs 736-745

Topic 2 – Open vs Closed Populations
Read pgs 745-753

Topic 3 – r and K selected species
Read pgs 755-756

Topic 4 – Interactions Between Species
Read pgs 762-771

Topic 5 – Succession
Read pgs 772-775

Topic 1 – Population Size and Density and Growth
Notes

- Population – a group of individuals of the same species living in the same area at the same time.

- Ecological Niche –role and position of a species (population) within a community, including
  - Habitat - where it lives in the ecosystem
  - Relationships - all interactions with other species in the ecosystem
  - Nutrition - its method of obtaining food.

- Pop. Size - # of organisms of the same species sharing the same habitat at a certain time
  - In Alberta there is 675 grizzly bears

- Pop. Density - # of organisms of the same species per unit of space
  - The density of Grizzly Bears in Jasper National Park in 2006 was 11 bears/1000km^2

- Determining the density of Population
  - Formula

$$D = \frac{N}{A}$$

D = Density
N = total number of species in pop.
A = area occupied by the pop.

Ex: If 200 lemmings live in a 25 ha area of tundra near Churchill, Manitoba in 1980, what is the density of lemmings?

- Determining the Change in Density of a Pop.
  - It is useful to compare changes in pop. densities from one year to the next.
  - Rate of Change (R) = change in a pop. over a period of time.

$$\text{Rate of density change} = \frac{\Delta \text{ density}}{\Delta \text{ time}}$$

Example: Determine the change in density of a population of lemmings that had a pop density of 8 lemmings/ha in 1980 and 22 lemmings/ha in 1990

Distribution of a Population

- Clumped distribution
    - most frequent pattern of distribution
    - Individuals are clustered together in groups in response to
        - uneven distribution of resources
        - tendency of offspring to remain with parents, or
        - some type of social order
        - may be linked with defense (safety in numbers)
        - mating behavior.

- Uniform Distribution
    - members of the pop maintain a minimum distance from one another
    - indicates strong intraspecific competition
    - In plant pops, this could result from competition for water, sunlight, or available nutrients
    - among animals it indicates strong territoriality

- Random Distribution
    - least common pattern of distribution
    - occurs because members of a species do not frequently interact with one another or are not heavily influenced by the microenvironments within their habitat