APES Chapter 6 – Population and Community Ecology

Intro: New England forests Come Full Circle

a) This essay describes a process known as "secondary succession". Would you say that such changes in plant and consumer populations has occurred here in NE Ohio? Elaborate.

I. **Nature's levels of complexity** (hierarchy of biological systems)

A. (See p. 150) - Know these levels of ecological complexity. Define, give examples:

1. Individual / Organism
2. Population
3. Community
4. Ecosystem
5. Biome
6. Biosphere / Ecosphere

B. What levels of complexity exist below the level of Individual Organism?

II. Population Ecology

A. Describe the inputs and outputs that influence the sizes of populations:

B. List and describe the basic characteristics of populations:

1. Size
2. Density
3. Distribution
4. Sex ratio
5. Age structure

C. **Density-dependent factors** that influence population size…give examples:

What is meant by **"limiting resource" or limiting factor**? What did Gauss show?

What is meant by **"carrying capacity"?** What does it look like on a population graph?

D. **Density-independent factors**….give examples:

III. Population Growth Models

A. **Exponential Growth** –under what conditions does it occur?

B. What is the mathematical expression of this model? Define the variables.

Examples of exponential growth calculations: (see Do The Math, p. 156)

C. **Logistic Growth** – the S-shaped growth curve (see fig. 6.7, p. 156)

D. Variations on Logistic Growth

1. Overshoot and Die-off (Boom and Crash) Oscillations (fig. 6.9, p. 157)

2. Role of Predation on Prey Populations (fig. 6.10, 6.11, p. 158)
   Be able to discuss the factors that lead to these predator/prey oscillations.

IV. Reproductive Strategies and Survivorship Curves

A. **K – selected species** (controlled by carrying capacity) (see Table 6.1)

B. **r – selected species** (rapid reproductive rate!) (see Table 6.1)

C. **Survivorship Curves** (see fig. 6.12, p. 160)

D. **Metapopulations** – distinct populations that may overlap as organsims move along habitat corridors. Serves to introduce genetic diversity and adaptability to changing or harsh environmental conditions. Ex: Mountain lions

V. Species Interactions in Communities

A. **Competition** – for limiting resource …**Competitive Exclusion Principle** (see fig. 6.14, p. 161)

Note: often competition is **Intraspecific**….examples:

B. Competition for limiting resource…**Resource Partitioning** (see figs. 6.15 and 6.16, p. 162-163)

1. Temporal resource partitioning
2. Spatial resource partitioning
3. Morphological resource partitioning

C. **Predation** – (Interspecific competition)…know the 4 categories and examples:

1. True predators
2. Herbivores
3. Parasites / Parasitism (Symbiotic relationship)
4. Parasitoids

Note: Predation plays important role in controlling prey populations…Ex:

Note: Each of these types of competition drives a sort of natural selection "arms race" as defense mechanisms are countered with offensive adaptations.
Give examples:

D. **Mutualism** - (Symbiotic) describe and give examples:

E. **Commensalism** – (Symbiotic) describe and give examples:

F. **Keystone Species** – species that have a disproportionately large impact on an ecosystem…despite, often having relatively small population numbers.
List the roles of keystone species using examples:

VI. Changes in Community Structure Over Time – Ecological Succession

A. **Primary Succession** (see. Fig. 6.23, p. 168)

B. **Secondary Succession** (see fig. 6.24, p. 169)

C. **Aquatic succession** in lakes and ponds (see p. 6.25, p. 170)

VII. Factors Affecting Species Richness

3 Basic Processes determine number and types of species

1. colonization of area by new species
2. speciation within the area
3. losses by extinction within the area

A. Latitude

B. Time

C. Habitat Size and Distance: Theory of Island Biogeography

State the Theory:

What are the general conclusions of the theory?

Given that much of the remaining useful habitat is **"fragmented",** how might this theory be applied by conservation biologists in places like national parks or even the Cleveland Metroparks?

WORKING TOWARD SUSTAINABILITY
Bringing Back the Black-Footed Ferret

a) How was the Black-Footed Ferret nearly driven to extinction?

b) Explain how this example illustrates concepts like:

1. law of unintended consequences

2. MVP (Minimum Viable Population)

c) What are the challenges to bringing back a K-selected species?