**Chapter 6: Population and Community Ecology**

**Reading Guide**

**Vocabulary**

Learn the definition of each term. The *italicized* words are not necessarily in the textbook. The **bold** words require you to know more than just the definition.

Population

**Exponential growth (J)**

**Resource partitioning**

Community

Predation

Population ecology

**Logistic growth (S)**

Population size

**Mutualism**

Population density

Overshoot

**Commensalism**

Population distribution

Die-off

**Symbiotic**

Sex ratio

**K-selected species**

**Keystone species**

Age structure

**r-selected species**

Predator-mediated

competition

Density-dependent factors

**Survivorship curves**

Ecosystem engineers

Limiting resource

Ecological succession

Carrying capacity (K)

**Metapopulation**

**Primary succession**

Density-independent factors

Community ecology

**Secondary succession**

Growth rate

Competition

Pioneer species

Intrinsic growth rate (r)

**Competitive exclusion**

**principle**

Theory of island biogeography

*Biotic potential*

*Bottom up control*

*Doubling time*

*Environmental resistance*

*Top down control*

*Climax community*

**Reading Outline**

New England Forests Come Full Circle

1. Explain why the forests of New England demonstrated resilience. You should start by defining resilience (from an environmental perspective).
2. Describe the series of changes that occurred as the land changed from farm to forest.
3. Provide three examples of interdependency in New England forests (ways a specie relies on another)

**6.1 Nature exists at several levels of complexity**

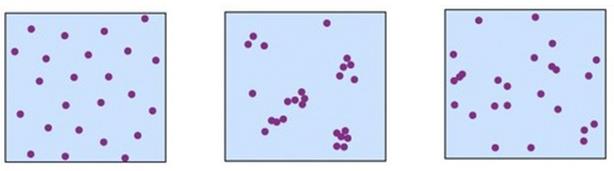
1. Put the following levels of organization in order from least complex (1) to most complex (5)
   1. \_\_\_\_ Biosphere
   2. \_\_\_\_ Community
   3. \_\_\_\_ Ecosystem
   4. \_\_\_\_ Individual
   5. \_\_\_\_ Population

**6.2 Population ecologists study the factors that regulate population abundance and distribution**

1. For each statement below, match it with the appropriate term

|  |  |
| --- | --- |
| \_\_\_\_ How a population occupies space  \_\_\_\_ The number of individuals in each age category  \_\_\_\_ The number of individuals per unit area  \_\_\_\_ The ratio of males to females  \_\_\_\_ The total number of individuals in a population | 1. Size 2. Density 3. Distribution 4. Sex ratio 5. Age Structure |

1. Label the following pictures as random, uniform or clumped distribution.



1. Label the following as density dependent (DD) or density independent (DI) factors
   1. \_\_\_\_\_\_ A tornado
   2. \_\_\_\_\_\_ Amount of food available
   3. \_\_\_\_\_\_ Availability of water
   4. \_\_\_\_\_\_ Climate change
   5. \_\_\_\_\_\_ Drought
   6. \_\_\_\_\_\_ Freezing temperatures
   7. \_\_\_\_\_\_ Predation
   8. \_\_\_\_\_\_ Spread of disease

**6.3 Growth models help ecologists understand population changes**

1. Fill in the following chart

|  |  |  |
| --- | --- | --- |
| **Trait** | **r-selected** | **K-selected** |
| Level of parental care |  |  |
| Life Span |  |  |
| Number of offspring |  |  |
| Number of reproductive events |  |  |
| Population dynamics |  |  |
| Population growth rate |  |  |
| Population regulation |  |  |
| Size of offspring |  |  |
| Time to reproductive maturity |  |  |

1. Fill in the following chart on survivorship curves

|  |  |  |
| --- | --- | --- |
| **Survivorship Curve** | **Description** | **Example species** |
| Type I |  |  |
| Type II |  |  |
| Type III |  |  |

**6.4 Community ecologists study species interactions**

1. What is the difference between competitive exclusion and resource partitioning? Which one is likely to be associated with a full niche overlap? A partial niche overlap?
2. Give an example of each type of resource partitioning
   1. Temporal –
   2. Spatial –
   3. Morphological -
3. Fill in the following chart for species relationships

|  |  |  |  |
| --- | --- | --- | --- |
| **Relationship** | **Description** | **Specific Example** | **+/+, +/-, +/0** |
| Commensalism |  |  |  |
| Competition |  |  |  |
| Herbivores |  |  |  |
| Keystone Specie |  |  |  |
| Mutualism |  |  |  |
| Parasites |  |  |  |
| Parasitoids |  |  |  |
| True predators |  |  |  |

**6.5 The composition of a community changes of time**

1. What is the main difference between primary and secondary succession?

**6.6 The species richness of a community is influenced by many factors**

1. What happens to the level of biodiversity as
   1. You move from the poles to the equator?
   2. A habitat gets older?
   3. A habitat gets smaller?
   4. The more separated a habitat is?

WTS – Bringing Back the Black-Footed Ferret

1. Describe the role of prairie dogs in the grassland ecosystem. Why did ranchers not like them?
2. Describe the role of the black-footed ferret in the grassland ecosystem? Why did their populations decline?
3. What kind of specie is the black-footed ferret (K or r) and how did this impact its recovery?
4. List some of the actions taken to help the ferret population recover.

Additional Work:

Answer the MC questions at the end of the chapter and review the FRQs.

**Chapter 7: The Human Population**

**Reading Guide**

**Vocabulary**

Learn the definition of each term. The *italicized* words are not necessarily in the textbook. The **bold** words require you to know more than just the definition.

***China’s One Child Policy***

Demography

Developed countries

Population momentum

Demographers

Developing countries

**Demographic Transition**

*Pre-industrial Phase*

*Transitional Phase*

*Industrial Phase*

*Post Industrial Phase*

Immigration

Life expectancy

**Family planning**

Emigration

Infant mortality

Affluence

Crude birth rate

Child mortality

**IPAT equation**

Crude death rate

**Age structure diagrams**

Urban area

**Total fertility rate (TFR)**

**Population pyramid**

Gross domestic product (GDP)

Replacement-level fertility

*Pre-reproductive group*

*Reproductive group*

*Post-reproductive group*

*Zero population growth*

**Reading Outline**

**The Environmental Implications of China’s Growing Population**

1. What is affluence? Look it up if you do not know.
2. At the moment, who is more affluent: the US or China? Why is China’s increasing affluence of such concern?
3. Briefly describe China’s One Child Policy. Is it working?

**7.1 Scientists disagree on Earth’s carrying capacity**

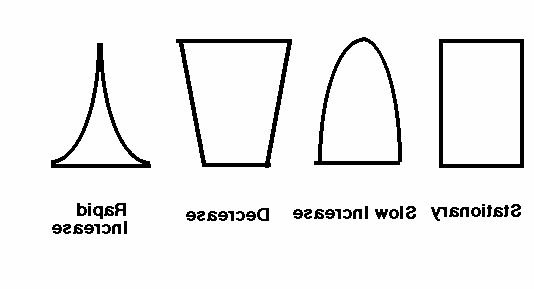
1. Who is Thomas Malthus and what did he have to say on carrying capacity?
2. List some potential limiting factors for the human populations.
3. How could technology help humans overcome limiting factors? Give a few examples from the past.

**7.2 Many factors drive human population growth**

1. Fill in the table below comparing some demographic indicators in a developed versus a developing country

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicator** | **Description** | **Developed country** | **Developing country** |
| *Total Fertility Rate (TFR)* | *The total number of children a woman will have in her lifetime* | *Low (~2.1)* | *Higher (>2.5)* |
| Replacement Level Fertility (RLF) |  |  |  |
| Life expectancy (LE) |  |  |  |
| Infant Mortality Rate (IMR) |  |  |  |
| Child Mortality Rate (CMR) |  |  |  |

1. TFR and RLF can help us understand how a population will change:
   1. If TFR > RLF, then the population is likely \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. If TFR = RLF, then the population is likely \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. If TFR < RLF, then the population is likely \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What factors influence infant mortality rate and life expectancy?
3. Why is death rate not always a useful indicator of a country’s standard of living? (Use the US and Mexico example)
4. Where is HIV/AIDS having the biggest impact on population?
5. Label the following population pyramids/age structure diagrams as likely to grow rapidly, grow slowly, stay the same or shrink in the future



1. Why is migration important in environmental science?

**7.3 Many nations go through a demographic transition**

1. Fill in the following chart to show how a population changes over the course of a demographic transition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Phase** | **Birth Rate** | **Death Rate** | **Growth Rate** | **Level of economic development** | **Level of medical care available** | **Example Country(ies)** |
| *Phase 1: Pre-Industrial* | *high* | *high* | *low* | *low* | *low* | *Lesotho* |
| Phase 2: Transitional |  |  |  |  |  |  |
| Phase 3: Industrial |  |  |  |  |  |  |
| Phase 4: Post Industrial |  |  |  |  |  |  |

1. List some of the challenges faced by countries in each phase of the demographic transition:
   1. Phase 1 –
   2. Phase 2 –
   3. Phase 3 –
   4. Phase 4 –

**7.4 Population size a consumption interact to influence the environment**

1. There are many factors involved in predicting the impact a population will have on the environment. We can summarize those factors with the IPAT equation. I= Impact. Describe each factor and how it influences impact.
   1. P –
   2. A –
   3. T –
2. Give an example of some helpful technologies and some examples of destructive technologies.
3. Briefly describe some of the impacts we might see on the following levels:
   1. Local –
   2. Global –
   3. Urban -
4. Give a few examples of how rising GDP leads to greater environmental impacts.

**7.5 Sustainable development is a common, if elusive, goal**

1. What conclusions did the Millennium Ecosystem Assessment Project draw?

WTS – Gender Equity and Population Control in Kerala

1. Why is India’s population continuing to grow even though their growth rate is down to 1.5%? There is a vocab word for this phenomenon!
2. How did Kerala reduce their birth rate, mortality rate and TFR?
3. Why is gender equity critical to population control?

Additional Work:

Answer the MC questions and FRQ #2 at the end of the chapter.

**Chapter 18 : Conservation of Biodiversity**

**Reading Guide**

**Vocabulary**

Learn the definition of each term. The **bold** words require you to know more than just the definition. *Italicized* words may not be in the book, but should be in the lecture.

Biosphere reserve

**Biotic pollution**

Buffer zone/area

Captive breeding

**CITES**

**Convention on International**

**Trade in Endangered Species (CITES)**

Core area

Data-deficient species

Debt for nature swap

Ecological restoration

Edge habitat

Endangered species

**Endangered Species Act**

Endemic species

Extinct species

**Habitat corridor**

Habitat fragmentation

Habitat Loss

Inbreeding depression

Invasive species

IUCN Red List

**Lacey Act**

Least concern species

**Marine Mammal Protection Act**

**Marine Protected Area**

Mitigation banking

Native species

Near-threatened species

Overharvesting

Seed bank

Sixth mass extinction

Theory of island biogeography

Threatened species

Transition zone

Maximum sustainable yield

Minimum viable population

Intrinsic value

Instrumental value

Indicator specie

National Wilderness Preserve

**Reading Outline**

Modern Conservation Legacies

1. What is causing the 6th extinction?
2. How does the United States conserve habitat and biodiversity? Give a few examples.
3. George Bush established Marine Protected Areas (MPAs) around Hawaii. What is the significance of this? Why did we need an MPA? What are the benefits of being a MPA?

**18.1 We are in the midst of a 6th mass extinction**

1. What is inbreeding and why is it a problem?
2. Give a few examples of genetic diversity loss that is NOT caused by humans.
3. Give a few examples of genetic diversity loss that is caused by humans.
4. How can you increase genetic diversity in a population?
5. What are the dangers of having limited genetic diversity in our food supply?
6. How does a seed bank hope to mitigate some of those risks?
7. How reliable are our estimates about biodiversity and biodiversity loss? Give an example or two to explain your answer.

**18.2 Declining biodiversity has many causes**

1. We often use the abbreviation HIPCO to remember the causes of species loss. Briefly describe each letter below. You might want to include an example.
   1. Habitat loss (H) –
   2. Invasive (or alien or exotic) Species (I) –
   3. Pollution (P) –
   4. Climate change (C) -
   5. Overharvesting (O) -

1. Which of the above is the greatest cause of species loss?
2. What is the difference between the Lacey Act and CITES?

**18.3 Conservation of biodiversity often focuses on a single species**

1. What are some ways to increase the population of a single declining specie?
2. Why is the Endangered Species Act controversial?

**18.4 Conservation of biodiversity sometimes focuses on protecting entire ecosystems**

1. What are the advantages of protecting an entire ecosystem versus a single species?
2. When protected ecosystems, we need to consider size shape and connectedness.
   1. Why does a habitat need to be large?
   2. Why does a habitat need to be connected?
   3. What does SLOSS mean?
3. Explain what a core area, a buffer zone and a transition area are.

WTS - Swapping Debt for Nature

1. What is a debt-for-nature swap? Give one specific example.
2. Do you think debt-for-nature swaps are a good idea? Why or why not.

Additional Work:

Answer the MC at the end of the chapter and complete FRQ #2.