SNC1D
CHAPTER 2: POPULATIONS & SUSTAINABLE ECOSYSTEMS

2.1: POPULATIONS & RESOURCES

Population **See Textbook Page 49**

A population is a group of individuals of the same _____ living in the same area at a certain time, and can successfully _____.

Some examples of populations that live in _____ecosystems are deer, wolves, ants, and maple trees.

Some examples of populations that live in _____ ecosystems are salmon, frogs, and water lilies.

Exponential Growth **(See Page 49 including Figure 2.1)**

Exponential growth is an _____ growth that produces a _____ shaped curve when the population is graphed against time.

Reproduction is generally a multiplicative process, which means that during a period of time, the species doubles or triples or quadruples, etc. Nearly all populations will tend to grow **exponentially** under the following conditions:

- **Limiting factors** are absent
- **Resources** are available

The above conditions often last for only a _____ time in nature.

Give ***one example of each*** of the two conditions stated above. You may use examples from your textbook.

1. **Limiting factors** are absent →

2. **Resources** are available →

Two of the most basic factors that affect the ***rate of population growth*** are the **birth rate** and the **death rate**. The rate of increase in a population is the birth rate minus the death rate.

Factors that Limit Population **(See Textbook Page 50)**

All populations have different factors affecting their growth and survival. The **carrying capacity** will depend on the availability of **nutrients**, **habitat**, **water**, **climate**, and **predator-prey relationships**.

① Nutrients

The water and _____ cycles (done earlier) are two cycles involved in the Earth's systems that affect the carrying capacity and population of an ecosystem.

② Habitat

A wildlife habitat is the area in which food, shelter, and space is available for an animal population. All animals and _____ have different requirements for growth and reproductive success. The size and the shape of an ecosystem will limit the types of species and the size of populations it can support. In _____ ecosystems, some plants and animals are adapted to open areas while others are adapted to woodland interiors.

③ Climate

Temperature ranges and the amount of precipitation will limit the types of species capable of surviving in the ecosystem. For example, large mammals with thick fur coats are not adapted to desert-like conditions. When conditions are just right, populations may _____ rapidly; such is the case with mosquito outbreaks in the spring.

In addition to precipitation and temperature, the amount of light and the strength of winds may also limit the populations of plants and animals.

④ Predator-Prey Relationships

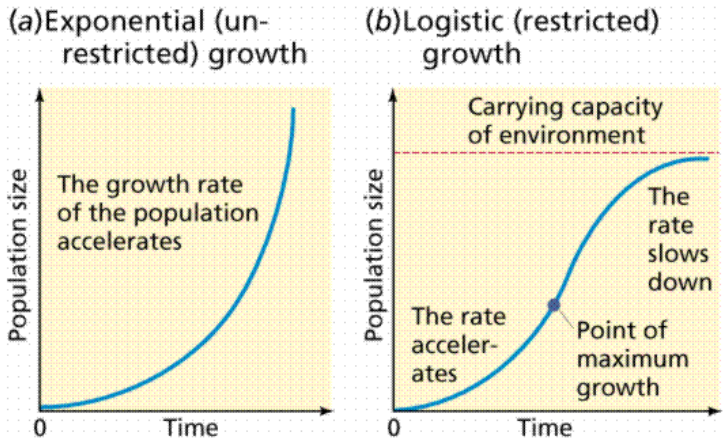
Predators are perhaps one of the most important _____ factors. They are a natural control in maintaining populations. Often times the predator and prey populations will fluctuate with one another; as prey numbers decrease so too will the numbers of _____.

Carrying Capacity **(See Textbook Page 51 including Figure 2.5)**

The Earth can only support so many people without causing permanent damage to the environment. For any ecosystem, _____ is the maximum _____ of its population that can be supported _____ by the resources and services found in that ecosystem.

When a population is maintained at its carrying capacity, the size of the population is at _____, or balance. If a species' population rises above the carrying capacity, damage to the environment may occur, and the species numbers will eventually start to decline due to a lack of _____ such as food, or because of increased predation or disease.

Two modes of population growth



The _____ curve (also known as a **J-curve**) occurs when there is no limit to population size.

The _____ curve (also known as an **S-curve**) shows the effect of a limiting factor (in this case the carrying capacity of the environment).

Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com).

- ***What do you think would happen if a population of animals exceeded the carrying capacity? What would happen to the sustainability of the ecosystem?***

Check Your Understanding

1. When do populations tend to increase?

2. Why did the re-introduced turkey population in Ontario grow exponentially?

3. List 3 examples of limiting factors.

4. Occasionally, humans are put in situations in which their resources are limited. In the summer of 2003, eastern North America experienced a sustained power failure. What resources do you think became quickly limited?

5. How are limiting factors and carrying capacity related?

6. How does climate limit populations?

7. Why are predators important in maintaining ecosystem functioning?

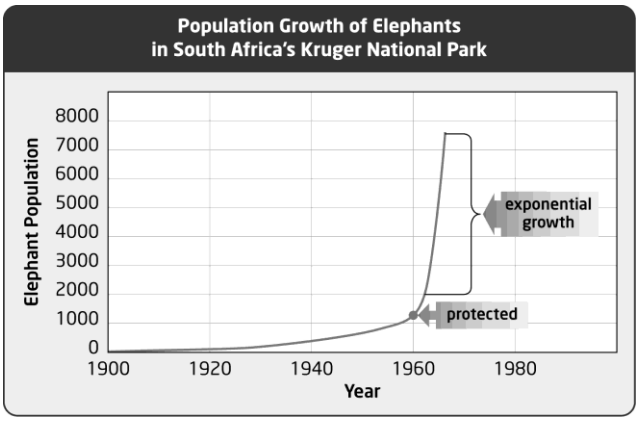
8. COMPLETE ***ACTIVITY 2.2*** on page 52 (all parts).

Attach your completed Activity 2.2 to the end of Section 2.1 handout.

Section 2.1 Review

BLM 2-4

1. This graph shows exponential growth. Exponential growth is NOT sustainable because



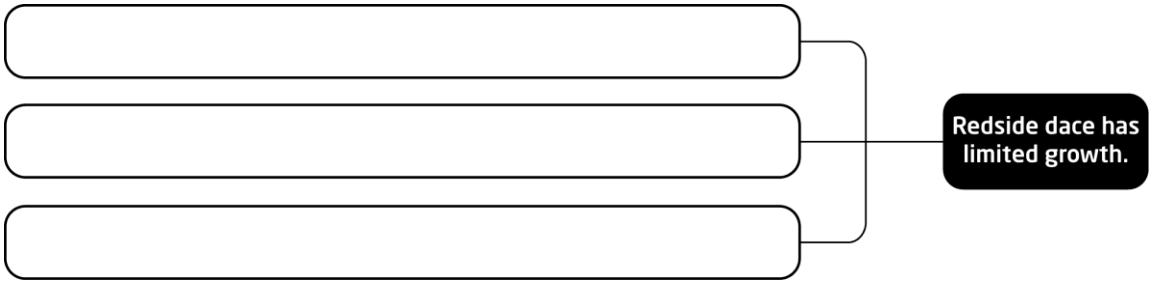
2. Complete this flowchart.

People remove dead trees from a forest. → Fewer flying squirrels can live in the forest. (The carrying capacity is reduced.)

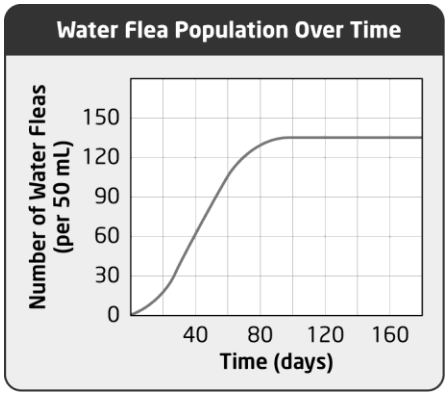
3. Complete this table. These whiptail lizards produce only females. The females can produce 10 daughters each year.

Population of Whiptail Lizards	
Year	**Population**
1	1
2	10
3	

4. The redside dace is described on page 53. What factors limit the growth of the redside dace? Complete this cause and effect map. Describe how each factor works. (Two factors are on page 53. Think of one other factor.)



5. This graph shows how a population of water fleas changed over time.



Complete each sentence. Use these words and information from the graph.

carrying capacity equilibrium exponential growth limiting factors

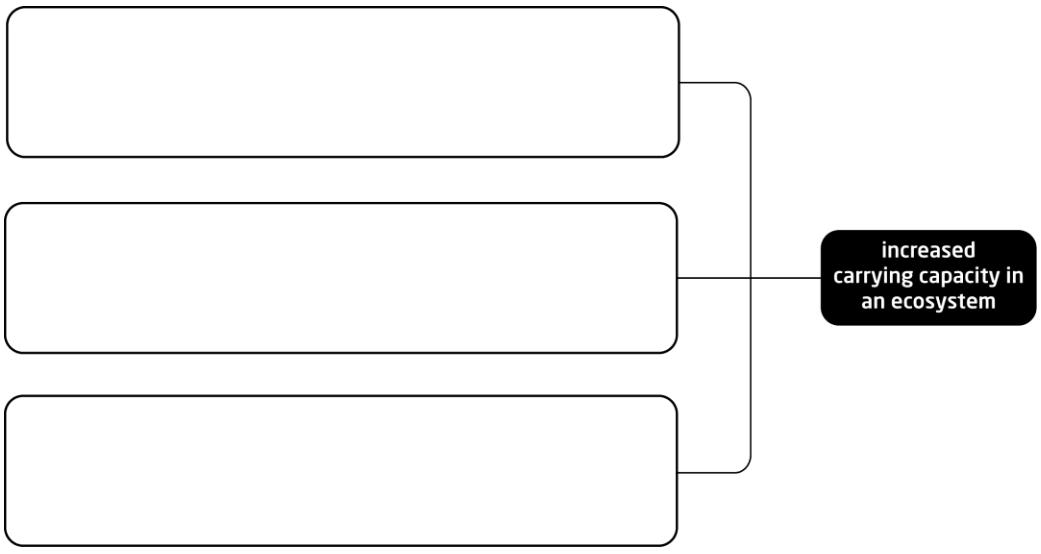
a) At first, the population showed _____.

b) After about _____ days, _____ caused growth to slow down.

c) _____ for the water fleas is about _____ per 50 mL.

d) The population of water fleas reached _____ at about _____ days.

6. Complete this cause and effect map. Include human activities that can maintain or increase carrying capacity in an ecosystem.



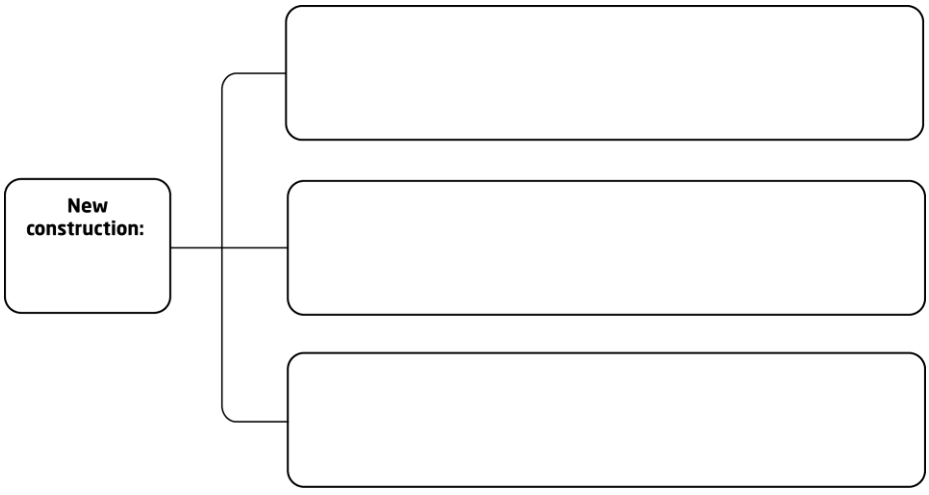
7. **See Pages 52 & 54.**

a) Define the term "urban sprawl." Describe the negative effects from urban sprawl.

b) Define the term "intensification."

c) Draw a diagram that illustrates intensification. Add labels.

8. **a)** Complete this flowchart about new construction that you know about. Describe its effect on the ecosystem.



b) Name a species you know about. _____

List 3 limiting factors that limit the population of the species.

_____