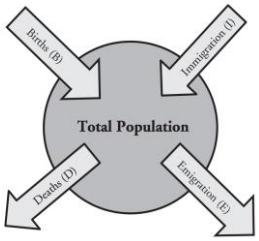
Name: _____KEY_____Per:_____Date:_____

Population Ecology Test Review: http://quizlet.com/2831889/ecology-flash-cards/



1. What are some factors that affect population size? (there are 4) Explain their effects.

Population Size Factor	Definition	Effect on Population Size (increases, decreases, stays the same)
1. Natality/Birth Rate	The number of organisms born into a given population.	Increase
2. Mortality/Death Rate	The number of organisms that die in a given population	Decrease
3. Immigration	The movement of organisms into a given area.	Increase
4. Emigration	The movement of organisms out of a given area.	Decrease

2. How is population density calculated? Sample Problem: A small farming community in Texas covers 14 square kilometers. There are 420 individuals who live within the town limits. What is the population density of this community? **Formula for density** = Number of organisms/area

Population density is calculated by dividing the number of organisms present by the unit of area in which they are located.

PD = 420 individuals/14 sq. km

PD = 30 individuals/sq. km

3. If there are 50 macroinvertebrates per square foot of stream and the area of the stream sampled is 10 feet long by 10 feet wide how many macroinvertebrates are estimated to exist in this stream?

Formula for Population Size= (area) x (density)

Area = L x W

Area = 10 ft x 10 ft

Area = 100 sq. ft

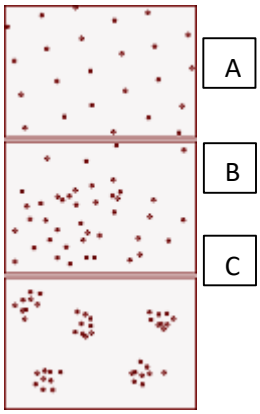
Population Size = 100 sq.ft x 50 macroinvertebrates/sq. ft

= 5000 macroinvertebrates

4. Describe the types of population dispersion patterns and give examples of each.

Population Dispersion Pattern	Description	Examples
Uniform or Even	- Recognizable pattern - Even spacing between organisms	-Corn field -Apple Orchard -Geese flying in a "V" formation
Random	- No recognizable pattern -Uneven spacing between organisms	-Deer in a forest -Trees in a forest -Snakes in a desert
Clumped	- Small or Large groupings of organisms in distinct areas.	- Herds of elephants - Schools of fish

5. A student estimates population size by using random sampling for each of the three populations seen to the right. Which population will give the estimate population value closest to the actual value and therefore will be the most accurate? Why?



Population **pattern A** will provide the most accurate estimate of the actual population because it is a uniform arrangement. When using random sampling, this pattern provides the student with data from each of her sampling trials regardless of which area she samples from. **Choice C** (clumped) would provide her with the least accurate estimate due to the fact that she could possibly sample areas that have no organisms present thus skewing her data to appear lower than the actual population size.

6. One of the small islands off the coast of Ecuador experiences a bloom of plant growth especially providing seeds for birds. Only 2 finches (bird species) emigrate from the area while 15 finches fly in from other islands where food is scarce. Because the finches are thriving and doing well there are 25 new birds born while only 8 die. What is the overall effect on population size? See formula below.

Population Growth = (Births + Immigration) - (Deaths + Emigration)

PG = (25 + 15) - (8 + 2)

PG = +30

The overall effect on the population of finches in this example would be a net growth of 30 individuals.

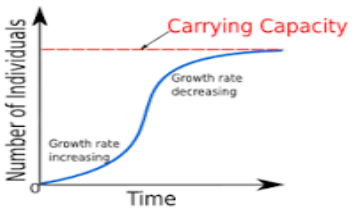
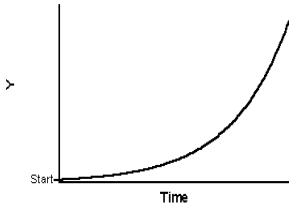
7. In order to estimate the population of rabbits in North Carolina, ecologists originally marked 10 rabbits and then released them back into the population. Over a 5 year period, rabbits were trapped and their numbers recorded. Using the formula below estimate the size of the rabbit population. What type of method was used: Random sampling or Mark and Recapture? Use formula provided below.

Estimated Population Size = (total number captured) x (number originally marked) / (total number recaptured with mark)

Year	Total Rabbits Captured	Number recaptured with Mark
1980	10	1
1981	14	1
1982	12	1
1983	9	0
1984	4	2
Total	49	5

EPS = 49 x 10 / 5 = 490/5 = 98 rabbits. This is an example of the Mark and Recapture method.

8. Contrast the different types of population growth patterns

Population Growth Pattern	**Sketch of Graph**	**Characteristics of Population**
Logistical or Logarithmic "S - Curve Model"		- limited resources (food, water, space, etc) - Possible disease pressures - Possible predation pressures.
Exponential "J - Curve Model"		- Unlimited resources - No disease - No predation Basically, ideal conditions for population growth.

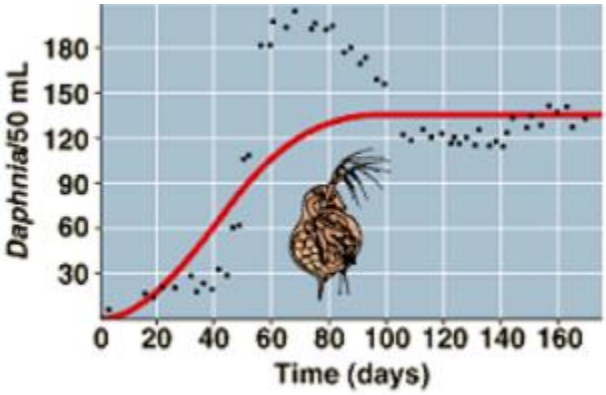
9. What is the difference between a density dependent limiting factor and a density independent limiting factor? Density Dependent limiting factors are those "factors" that limit the size of a population and DEPEND upon the number of individuals that make up the population. For example, disease is a density-dependent limiting factor because its impact on the size of the population DEPENDS upon how many organisms are present. Think about the flu….it spreads more effectively when there are large, dense groups of people.

Density independent limiting factors are those "factors" that limit the size of a population and DO NOT DEPEND upon the number of individuals that make up the population. For example, a tsunami or other weather related event (hurricane, waterspout, tornado,etc) will kill and/or limit the any population it encounters regardless of the population density or size.

10. From the following list of limiting factors choose I for density independent and D for density dependent.

a. ____D__parasitic infection such as tapeworms affecting a population
b. ___ I__hurricane leading to flooding
c. ___I___volcanic eruption resulting in ash deposits over a wide area
d. ___I___ Heat-wave with little rain for an extended period of time
e. ___D___ over-crowding leads to competition among fish for available food sources

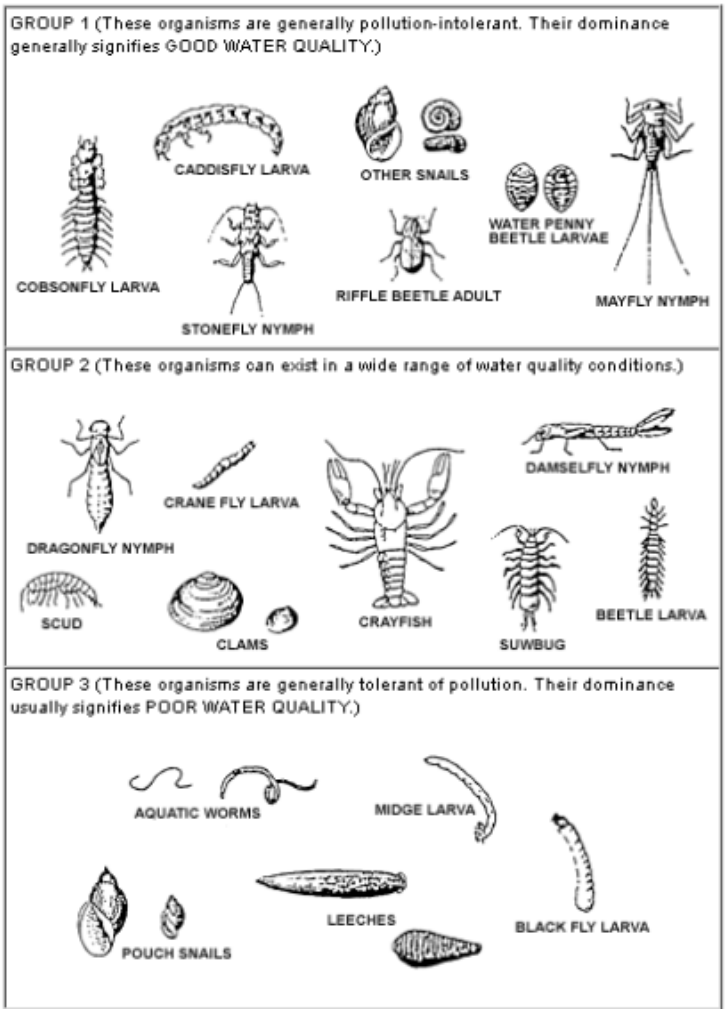
11. Interpret the graph to the right in terms of type of population growth pattern. Give an example of a possible density dependent limiting factor and density independent limiting factor. Describe the carrying capacity of the Daphnia according to the graph.



The graph displays a logistical growth pattern. One possible density dependent limiting factor affecting the daphnia might be competition. One possible density independent limiting factor might be water pH. The carrying capacity for daphnia in the graph would be between 120 and 130 daphnia /50 ml of water. This represents the maximum number of daphnia that can be supported in this given environment.

12. Data Regarding Macroinvertebrates in Two areas in Naugatuck Watershed

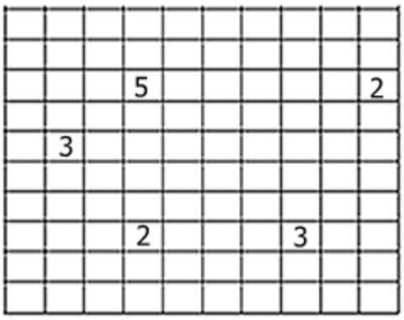
	Number of Organisms	
	Longmeadow Brook Stream	Naugatuck River, Naugatuck CT
Caddisfly larva	31	8
Midge Larva	17	51
Cranefly Larva	32	28
Scud	20	13
Total Sampled	100	100



Interpret the data for each sampling site. Use data to support statements. When might these samples have been taken?

It can be inferred from looking at the data present in the table that the pollution levels in the two collection sites are different. It can also be inferred that the pollution levels found in the Longmeadow Brook are lower than those pollution levels found in the Naugatuck river. This inference is supported by the fact that the Longmeadow Brook holds larger populations of macroinvertebrates from "Group 1" which are typical bioindicators of "Good Water Quality". Likewise, the Naugatuck River holds larger populations of macroinvertebrates from "Group 3" which are typical bioindicators of "Poor Water Quality".

13. An Ecologist uses a method of population size estimation of macroinvertebrates in a stream. She plots a 10x10 area and randomly chooses 5 spots to sample with a net. She counts the number of invertebrates sampled and estimates the total population size. What is the type of method used to estimate population size? SHOW WORK



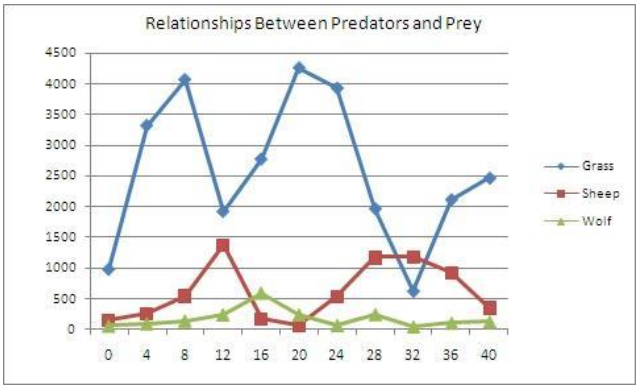
Population Size = (density) x (area)
=(organisms/grid) x (total number of grids)

The type of method being used in this example is random sampling.

Step 1 - 15 organisms/5 boxes = 3 organisms per box

Step 2 - 3 organisms per box X 100 boxes = 300 macroinvertebrates total

14. Interpret the graph to the right. Describe a relationship between two of the organisms shown.
One relationship that is evident from looking at the graph is that as the population of sheep increase, the population of grasses decrease. This is logical since the sheep feed on the grasses. Secondly, as the population of sheep decrease, the overall population of grasses increases.



15. How might the introduction of an invasive species of plant affect the organisms shown on the graph? The introduction of an invasive species of plant could negatively impact the population of native grasses that inhabit this ecosystem. The invasive species might outcompete the native species for nutrients and sunlight causing the native species to decline. This decline might impact the primary consumers because they would have a smaller food supply. If the primary consumers were unable to eat and digest the invasive species, they would have to emigrate out of their existing location in order to acquire the necessary nutrients for survival. If they were unable to leave then their population would decrease.

16. Review the different types of solutions to help restore health to watersheds.

Restoration Strategy	How it works	Results on watershed
Dam Removal	By removing dams, river systems are once again open to the migratory fish that use these ecosystems as a breeding area. By removing these structures fish can access the needed habitats for mating and reestablishing their population numbers.	The result is a positive one because by providing the fish with a means by which they can reach their breeding grounds, the nutrient values that these returning fish bring with them is returned to the watershed through their death. Such as decaying material or food sources for many organisms within the watershed.
Phytoremediation	This is the use of plants to remove harmful pollutants from both water and soil. These plants are capable of acting as a filtration mechanisms that slowly traps and removes pollutants.	The result is a positive one. By removing pollutants and resorting watershed to their former health, many organisms benefit.
Thermal pollution Reduction	This method of pollution reduction aims to lower the temperature of water before it reenters an aquatic ecosystem. We know that warmer water will hold less oxygen and as a result promote the growth of algae. This can have a negative impact on many organisms that cannot thrive in warm, low-oxygen waters.	By removing excess heat from water before returning it to the environment, higher oxygen levels will result. This can prevent the growth of algae and promote a healthy, oxygen rich environment.

17. Name at least three specific steps <u>you</u> can do to improve the quality of water in the Naugatuck River and watershed.

- Do not introduce pollutants into the watershed such as washing a car and allowing the soaps and waxes to runoff into road drains.
- Pick up pet waste to prevent its introduction into the river system.
- Eliminate or reduce the amount of lawn fertilizers and pesticides used that can be introduced into the river system via runoff.