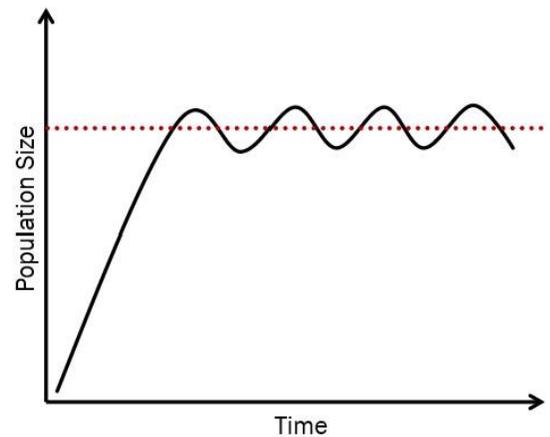


CARRYING CAPACITY and LIMITING FACTORS

Organisms need resources to survive. They also require space to live. There are limited resources and only so much space in an ecosystem. These features are called limiting factors. **Limiting factors** regulate how many organisms live in an ecosystem. Space, food, oxygen, and water are limiting factors. Temperature and precipitation determine the climate of an ecosystem, which impacts the organisms that can live in an ecosystem.

An ecosystem can support only so large of a population. The maximum population size that an ecosystem can support is called **carrying capacity**. Limiting factors determine carrying capacity. The availability of abiotic factors (such as water, oxygen, and space) and biotic factors (such as food) dictates how many organisms can live in an ecosystem. Carrying capacity is also impacted by the availability of decomposers. Decomposers break down and recycle dead organisms and organic matter. They prevent dead matter from accumulating and taking up space in an ecosystem.

In an ecosystem, the population of a species will increase until it reaches the carrying capacity. Then the population size remains relatively the same. If abiotic or biotic factors change, the carrying capacity changes as well. Natural disasters can destroy resources in an ecosystem. If resources are destroyed, the ecosystem will not be able to support a large population. This causes the carrying capacity to decrease. Humans can also alter carrying capacity. Our activities can decrease or increase carrying capacity. We alter carrying capacity when we manipulate resources in a natural environment.



If a population exceeds carrying capacity, the ecosystem may become unsuitable for the species to survive. If the population exceeds the carrying capacity for a long period of time, resources may be completely depleted. Populations may die off if all of the resources are exhausted.

Answer the questions below based on the Active Reading above:

1. *Organisms need _____ to live and _____ to survive.*
2. *What do limiting factors do?*
 - a. Separate biotic factors from abiotic factors.
 - b. Determine which is the predator and which is the prey.
 - c. Regulate how many organisms live in an ecosystem.
 - d. Determine which natural disasters will hit an area.
3. *Which of the following are abiotic limiting factors?*
 - a. The decomposers in an ecosystem.
 - b. The populations of producers in a given habitat.
 - c. Carrying capacities of several species.
 - d. Water, space, and oxygen.
4. *Which of the following is a biotic limiting factor?*
 - a. The amount of breathable oxygen available to a population.
 - b. Food available for organisms
 - c. The nitrogen to oxygen ratio in the air supply.
 - d. The number of bodies of water in a habitat.
5. *In biology, what is carrying capacity?*
 - a. The maximum population size an ecosystem can support.
 - b. A total list of the limiting factors.
 - c. How much weight an organism can lift.
 - d. How much pain an organism can tolerate.
6. *The size of the population of a species in an ecosystem is determined by the _____ factors and _____ factors.*
7. *Besides factors such as water, space, food, and oxygen, carrying capacity is affected by how many _____ there are.*
8. *What do decomposers do?*
 - a. Feed on carnivores exclusively.
 - b. Break down and recycle dead organisms and organic matter.
 - c. Prevent living organisms from taking up space in an ecosystem.
 - d. Feed on producers exclusively.
9. *What happens to the population of a species after it reaches its carrying capacity?*
 - a. Increases linearly over time.
 - b. Increases exponentially over time.
 - c. Decreases to zero in a very short amount of time.
 - d. Remains relatively the same.

10. *What can destroy the amount of resources in an ecosystem?*
- Natural disasters.
 - Tornados only.
 - Hurricanes only.
 - Tsunamis only.
11. *If a natural disaster devastates an ecosystem, what will this do to the carrying capacity of the population of a species within that ecosystem?*
- Increase it.
 - Will not affect it, so it will stay the same.
 - Always reduce it down to zero.
 - Decrease it.
12. *By which activity can humans change the carrying capacity of the population of a species?*
- Studying the niches of particular species.
 - Compiling a list of habitats in an ecosystem.
 - Manipulating resources in its natural environment.
 - Convincing it to reduce its carbon footprint.
13. *If the population of a species is greater than its carrying capacity for a long time, what can that do to available resources in its ecosystem?*
- Deplete them completely.
 - Double the amount.
 - Nothing, as there is no causal relation.
 - Triple the amount.

The following questions are based on the situations below.

Situation 1: A population of trout in a lake has significantly declined over the past year. The main source of food for the fish in this lake are aquatic insects. Due to poor climate conditions, there are significantly fewer insects and thus, not enough food to sustain the population of trout in the lake. Trout is a food supply for larger fish in the lake and without enough trout, other fish are negatively impacted in the lake.

14. What is the problem?

- a. Trout population has increased
- b. Insect population has increased
- c. Insect population has decreased
- d. Larger fish population has increased

15. What has caused the problem?

- a. Poor climate conditions
- b. Humans overfishing
- c. Pesticides being used on the insects
- d. Decreased water levels

16. How could humans alter carrying capacity so the trout population returns to its normal level?

- a. Humans could alter the carrying capacity by hunting the trout
- b. Humans could alter the carrying capacity by hunting the larger fish
- c. Humans could alter the carrying capacity by breeding the insects
- d. Humans could alter the carrying capacity by breeding the larger fish

Situation 2: The population of bullfrogs is growing out of control near a small pond. Its main predator, a snake species, was killed off by disease. Without this natural predator, the bullfrogs can thrive in and around the pond. The growing frog population is having a negative impact on the quality of the environment and other species living in the area.

17. What is the problem near the small pond?

- a. Bullfrog population is too small
- b. Bullfrog population is too large
- c. Snake population is too large
- d. Snake population is killing the bullfrogs

18. What has caused the problem?

- a. Natural Disaster wiped out the snake population
- b. Humans began hunting the snakes
- c. A disease killed all the snakes
- d. Snakes went to a different ecosystem

19. How could humans alter carrying capacity so the bullfrog population returns to its normal level?

- a. Humans could alter the carrying capacity by breeding bullfrogs
- b. Humans could alter the carrying capacity by hunting the snakes
- c. Humans could alter the carrying capacity by hunting the bullfrogs
- d. None of the above will help alter the carrying capacity

20. What is another possible solution to this problem? Explain why it will help alter the carrying capacity of the bullfrog population?

Amoeba Sisters Video: Carbon and Nitrogen Cycles

<http://bit.ly/ASCycle>

1. A compost is where biodegradable things _____
2. What are the two major things composts provide plants with? _____ and _____
3. What is the favorite element? _____
4. Molecules that contain carbon are _____ molecules
5. A carbon _____ is where carbon can be found.
6. Carbon _____ among the reservoirs
7. Carbon in the atmosphere is _____ and it is taken in by organisms that do _____
8. The plants and animals do _____ which releases carbon dioxide
9. When the plants and animals die after a long time the carbon can be turned into _____ fuels
10. Is too much carbon dioxide good or bad? _____
11. Nitrogen is the critical element in _____ and _____
12. Nitrogen gas makes up what percent of the atmosphere? _____
13. Nitrogen can be fixed by _____ which can be living in the soil or root of some plants.
14. The bacteria lives in _____ harmony.
15. What is an example of a nitrogen fixing plant? (look in corner of screen) _____
16. Animals eat the plants and obtain the _____
17. When the plants and animals decompose they return _____ to the soil in a process called _____
18. Nitrogen cycles happen in _____ and _____ environments
19. How can fertilizer be bad in the nitrogen cycle?
