

Ls2.C: Ecosystem Dynamics Functioning And Resilience

Base your answers to questions 1 on the information below and on your knowledge of biology.

Since 1980, the vulture population in India has declined from 40 million to 60 thousand due to poisoning by a pain reliever used in cattle. If only 1% of the cattle carcasses fed on by vultures are animals that have been treated with the drug, it can lead to a drastic decline in the vulture population. The grim picture is that over 10% of the carcasses have been found to contain this drug.

Vultures feed exclusively on the carcasses of dead animals. This helps to prevent the spread of diseases such as rabies and anthrax among wildlife, livestock, and humans. Without as many vultures present, other scavengers such as dogs have moved in and taken advantage of the newly available food. The abundance of these other scavengers has led to an increase in the number of cases of human rabies and an outbreak of tuberculosis, anthrax, and foot-and-mouth disease. These diseases are not spread to humans by vultures.

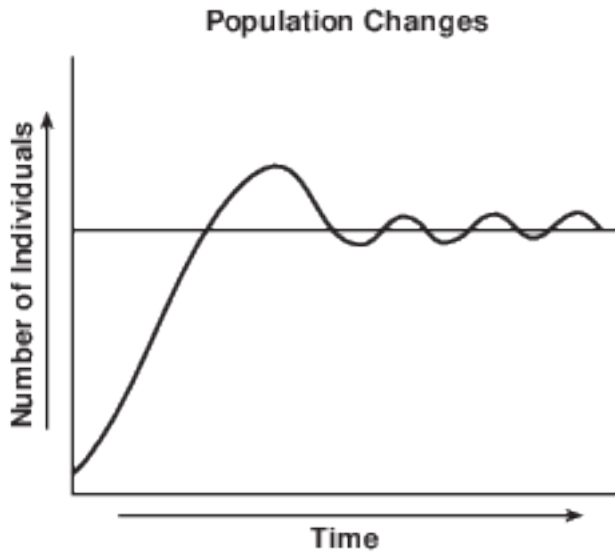
- 1 The best explanation for the increase in rabies, anthrax, and other diseases in humans is that the
 - (1) decrease in the number of vultures has upset ecosystem stability
 - (2) vulture population is being killed off by an increase in cases of human rabies
 - (3) vultures are changing their feeding role from scavenger to decomposer
 - (4) people are consuming scavengers that have eaten diseased vultures

- 2 Which statement best describes bat populations in a stable ecosystem?
 - (1) They are held in check by environmental factors.
 - (2) They are producers that rely indirectly on other producers.
 - (3) They are not limited by natural predators.
 - (4) They are not dependent on other species.

- 3 Which statement is an example of the inter- dependence of organisms?
 - (1) Owls hunt at night.
 - (2) Ants get food from insects and protect insects from predators.
 - (3) Ticks feed on the blood of animals and the ticks grow larger.
 - (4) Crows feed on dead mice.

- 4 Which statement best describes what is most likely to occur if an animal population grows larger than the carrying capacity of its environment?
 - (1) The birth rate will increase.
 - (2) Both the birth rate and death rate will decrease.
 - (3) The death rate will increase.
 - (4) Neither the birth rate nor the death rate will decrease.

- 5 The graph below represents some changes in the number of individuals in a particular population in a stable ecosystem over a period of time.



Which statement best describes the trend shown in this graph?

- (1) Ecosystem conditions will eventually cause a population to become extinct.
 - (2) In a stable ecosystem, the number of individuals in a population is usually maintained within a certain range.
 - (3) The interactions between a population and various factors in an environment are always predictable.
 - (4) In order for any ecosystem to maintain a balance, populations must be reduced to half their original number.
- 6 Rabbits produce large numbers of offspring during each reproductive season, yet the number of rabbits within a given population changes very little from year to year. The stability of the population size is most likely the result of
- (1) the development of mutations in young rabbits
 - (2) environmental factors that keep the population in check
 - (3) rabbits continuing to reproduce when the population is large
 - (4) the survival of more female rabbits than male rabbits

- 7 Each female housefly can lay approximately 500 eggs in a lifetime. She does this in several batches of about 75 to 150 eggs. Within a day, larvae (maggots) hatch from the eggs. They live and feed on organic material, such as garbage and feces. Scientists have calculated that a pair of flies beginning reproduction in April could be the ancestors of 191,010,000,000,000,000 flies by August.

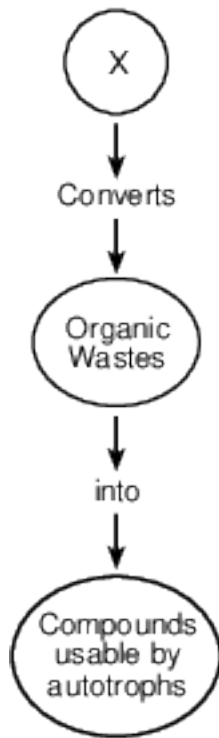


Source: <http://www.publicdomainpictures.net/download-picture.php?adresar=10000&source=1-1220978631q1uO.jpg&id=1137>

Which statement best explains why this does not happen?

- (1) Mutations develop in the young flies.
 - (2) Environmental factors keep the population in check.
 - (3) Flies continue to reproduce in large numbers.
 - (4) More female flies survive than male flies.
- 8 Which statement best describes an ecosystem maintaining a state of approximate equilibrium?
- (1) Nutrients from decayed organisms are recycled in a forest ecosystem.
 - (2) All the frog species in a South American rain forest become extinct.
 - (3) A mutation spreads through a species of bacterium, making them unable to decompose wastes.
 - (4) Mice are released into a field ecosystem as food for a declining predator population.

9 The chart below represents some of the events that occur during the cycling of nutrients in an ecosystem.



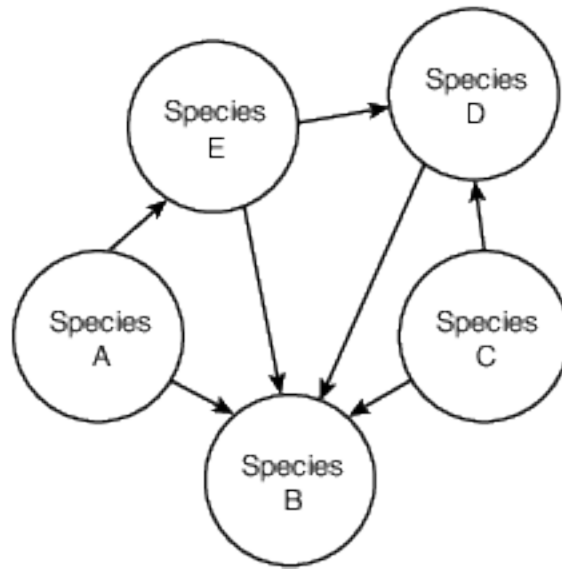
Which organisms would most appropriately complete the chart when written in the circle at X?

- (1) producers
- (2) herbivores
- (3) carnivores
- (4) decomposers

10 Which group of organisms in an ecosystem fills the niche of recycling organic matter back to the environment?

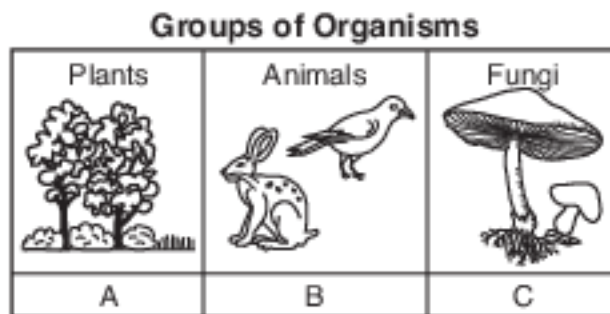
- (1) carnivores
- (2) decomposers
- (3) producers
- (4) predators

Base your answers to questions 11 on the diagram below and on your knowledge of biology. The diagram represents interactions between organisms in an ecosystem.



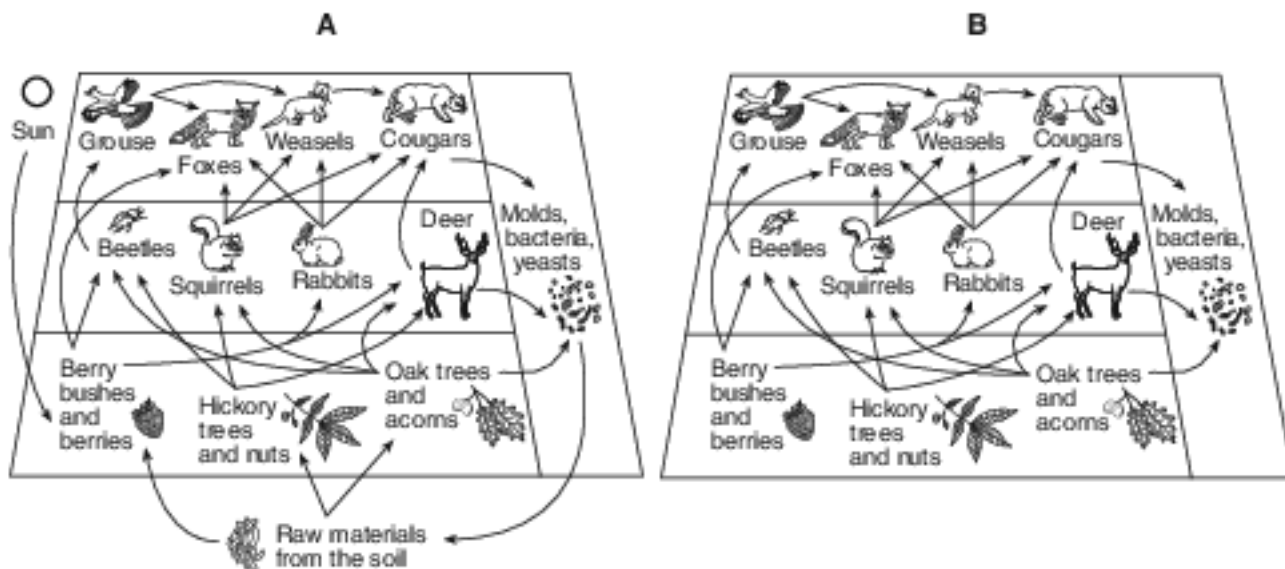
- 11 Which statement correctly describes an interaction that contributes to the stability of this ecosystem?
- (1) Species E is not affected by the activity of species A.
 - (2) Species B returns compounds to the environment that may later be used by species C.
 - (3) Species C recycles nutrients from species B and D to obtain energy.
 - (4) Species D is directly dependent on the autotrophic activity of species B.

Base your answer to question 12-15 on the diagram below and on your knowledge of biology. The diagram represents three groups of organisms that are part of an ecosystem.



- 12-15 Explain the role of these groups of organisms in the cycling of materials and the transfer of energy in an ecosystem. In your answer, be sure to:
- explain why an ecosystem requires a constant input of energy [1]
 - explain how organisms in group B obtain energy [1]
 - explain the role of organisms in group C in the ecosystem [1]
 - identify the process used by all three groups of organisms to make energy available to their cells to carry out life functions [1]

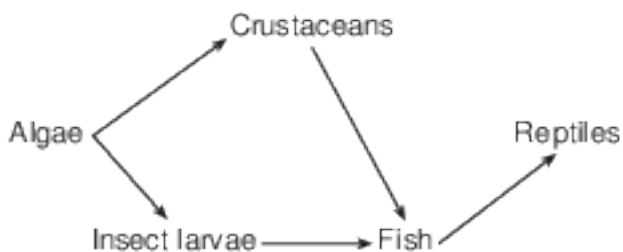
Base your answers to questions 16 on the diagrams below and on your knowledge of biology. The diagrams represent how various populations interact in a forest environment.



16 State what would most likely happen to one other population in this food web if all the squirrels and rabbits were suddenly killed by a viral disease. Support your answer. [1]

17 If a large quantity of herbicide, a chemical that is designed to kill weeds, were accidentally spilled into a large lake, it could endanger all the organisms living in the lake. State one way the effects of killing the weeds in the lake could be destructive to populations of fish and other animals. [1]

18 Part of a food web is represented below. It includes organisms located in a stream near farm fields.



Select one type of organism, other than the crustaceans, from the food web. State how the population of organisms you selected might be affected if the population of crustaceans in this food web were reduced due to the use of chemicals harmful to crustaceans in the fields near the stream. Support your answer. [1]

Organism:

Answer Keys

1 1

2 1

3 2

4 3

5 2

6 2

7 2

8 1

9 4

10 2

11 2

12-15 The student's response to the bulleted items in the question need not appear in the following order.

- 12. Allow 1 credit for explaining why an ecosystem requires a constant input of energy. Acceptable responses include, but are not limited to:
 - — Energy is always lost as it is transferred through the ecosystem.
 - — Energy is continuously needed for metabolic processes.
 - — It is needed so that autotrophs can make food.
- 13. Allow 1 credit for explaining how organisms in group B obtain energy. Acceptable responses include, but are not limited to:
 - — Some group B animals eat group A plants.
 - — Organisms in group B obtain energy from organisms in group A when they eat them.
 - — Group B eats plants, fungi, and/or other animals.
 - — The animals eat the plants.
 - — They obtain energy from their food.
- 14. Allow 1 credit for explaining the role of organisms in group C in the ecosystem. Acceptable responses include, but are not limited to:
 - — Organisms in group C break down dead organisms and return nutrients to the soil.
 - — Group C returns raw materials to the ecosystem by decomposing dead organisms.
 - — These organisms are decomposers who recycle nutrients in the ecosystem.
- 15. Allow 1 credit for identifying the process used by all three groups of organisms to make energy available to their cells to carry out life functions as respiration or cellular respiration.

16 Allow 1 credit for stating what would most likely happen to one other population in this food web

- if all the squirrels and rabbits were suddenly killed by a viral disease and for supporting the answer. Acceptable responses include, but are not limited to:
 - — The fox/weasel/cougar population would decrease because of less food.
 - — The oak trees would increase because there would be more acorns.
 - — The deer population might increase due to less competition for available food.
 - — The deer population might decrease due to greater predation by cougars.
 - — There would be more competition among foxes/weasels/cougars because of a decrease in food.

17 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Fish and other animal populations in the lake would be harmed because they depend on the plants directly or indirectly for food.
- — Fish and other animal populations would be harmed because they depend on the plants for oxygen.
- — There would be fewer hiding/breeding sites.

18 Allow 1 credit for stating how the organism selected would be affected if the population of

- crustaceans in this food web were reduced due to the use of chemicals harmful to crustaceans in the fields near the stream and supporting the answer. Acceptable responses include, but are not limited to:
- — The algae may increase because there are fewer crustaceans to eat it.
- — The insect larvae will decrease in population because fish will eat more of them.
- — The number of insect larvae will increase because there is more algae for them to eat.
- — The fish would only have insect larvae to eat because of fewer crustaceans.
- — Fewer crustaceans means less food for fish, which decreases reptile population.