



## Quiz 1 (Deer)

### Managing the Deer Park

**Please answer the questions below. This should take you about 10 minutes. A calculator, pen and paper might be useful. This is not an exam - we do not expect you to get every question right, the aim of the research is to find which teaching approaches work best. If you are not sure how to answer a question, simply choose the answer that you think is closest, or choose 'Don't know'.**

- \* 1. The deer herd grows at an effective rate of 40% (the annual birth rate is 50% and the annual death rate is 10%). If the initial herd size is 50 deer, how many deer will there be after the first **two** years?
- ☐ 60 deer
  - ☐ 75 deer
  - ☐ 98 deer
  - ☐ 132 deer
  - ☐ 148 deer
  - ☐ Don't know
- \* 2. If the initial herd size is 50 deer, and each deer eats 1 unit of vegetation per year, how many units of vegetation will they eat in one year? (Ignore deer births and deaths.)
- ☐ 50 units of vegetation
  - ☐ 100 units of vegetation
  - ☐ 150 units of vegetation
  - ☐ Don't know
- \* 3. If the whole deer park contains 1,000 units of vegetation, and each deer eats 1 unit of vegetation per year, what is the MAXIMUM number of deer it can support per year (its maximum capacity)?
- ☐ 100 deer
  - ☐ 1,000 deer
  - ☐ 10,000 deer
  - ☐ Don't know

\* 4. Which of the following statements do you think would be true if the deer population reached the maximum capacity of the park? Select all that apply.

- ☐ The deer population would eat all the vegetation (serious overgrazing)
- ☐ The vegetation will continue to regenerate itself
- ☐ Overgrazing could cause a reduction in the carrying capacity of the park
- ☐ The deer population would not be sustainable at that level

\* 5. A growth rate of 40% means the population doubles roughly every two years. If the deer population starts at 50, in how many years will the maximum capacity of the deer park be reached?

- ☐ In about 5 years
- ☐ In about 7 years
- ☐ In about 9 years
- ☐ In about 11 years
- ☐ Don't know

\* 6. Please write a sentence or two to explain what you think the word 'sustainable' means in this sentence: 'the deer population in the deer park is sustainable'.

\* 7. In your opinion, is the deer population in the park, starting with 50 deer, sustainable over a 20 year period, if left to grow without any management intervention?

- ☐ Yes
- ☐ No
- ☐ Don't know

\* 8. So far we have ignored the growth rate of the vegetation, which is about 10% per year. If there are 1,000 units of vegetation initially, **leaving aside the effect of the deer**, how many units will there be **in total** at the end of the first year?

- ☐ 800 units of vegetation
- ☐ 1,000 units of vegetation
- ☐ 1,100 units of vegetation
- ☐ 1,500 units of vegetation
- ☐ Don't know

\* 9. Following on from the last question, if you now take into account the consumption by the growing herd of deer, how many units of vegetation **in total** would you expect there to be at the end of the first year? Choose the most realistic answer, assuming that there 50 deer at the start of the year.

- ☐ About 1,030 units of vegetation
- ☐ About 1,040 units of vegetation
- ☐ About 1,050 units of vegetation
- ☐ About 1,060 units of vegetation
- ☐ About 1,100 units of vegetation
- ☐ Don't know, it is hard to estimate because the total number of deer changes during the year

Comments (optional)

\* 10. What do you think is the carrying capacity of the deer park? (The carrying capacity of the deer park is the maximum deer population it can sustain long term.) Assume the park contains 1,000 units of vegetation and grows at 10% per year, and that deer eat 1 unit each of vegetation per year.

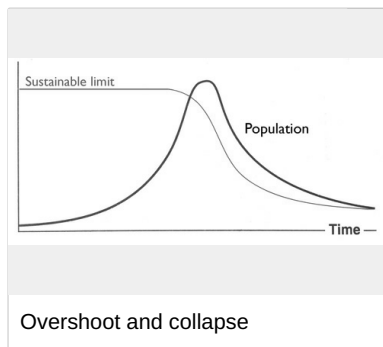
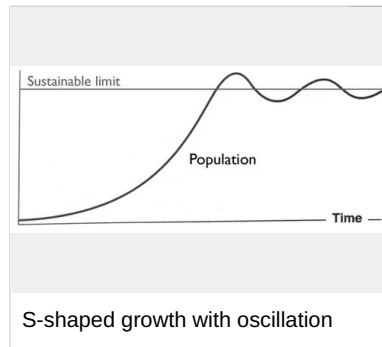
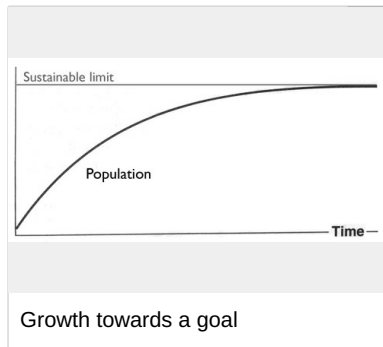
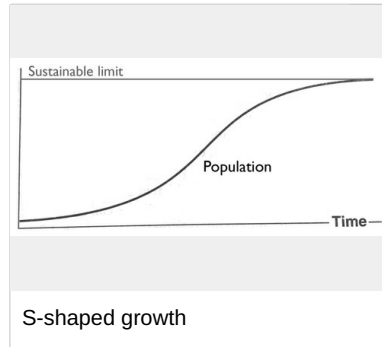
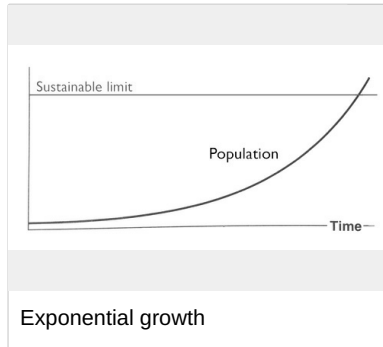
- ☐ 50 deer
- ☐ 100 deer
- ☐ 500 deer
- ☐ 1,000 deer
- ☐ 2,000 deer
- ☐ Don't know

Please give reasons for your answer

\* 11. Which of these conditions would result in an **increase** in the deer population over time? Select ONE OR MORE choices.

- ☐ Decrease in birth rate
- ☐ Increase in birth rate
- ☐ Decrease in death rate
- ☐ Increase in death rate
- ☐ Equal birth and death rate
- ☐ Birth rate greater than death rate
- ☐ Birth rate less than death rate

\* 12. The graphs below show common population growth patterns. The sustainable limit (green line) here means the carrying capacity. If not damaged, this will be a straight horizontal line. Which graphs show sustainable populations in your opinion? Select ONE OR MORE answers.



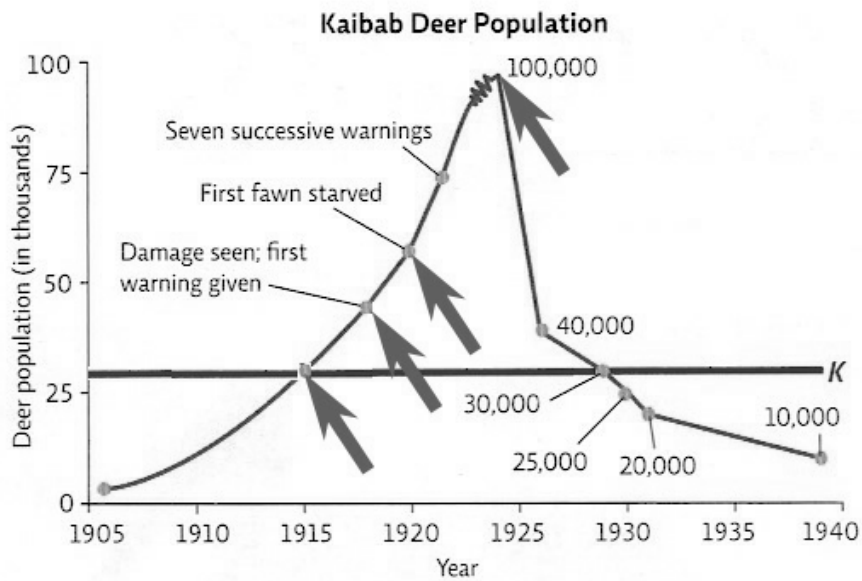
\* 13. Is there an advantage in keeping the deer herd population stable?

- ☐ No, there is no particular advantage, it can fluctuate
- ☐ Yes, deer reproduce rapidly so keeping the herd size stable prevents a possible explosion in numbers
- ☐ Don't know

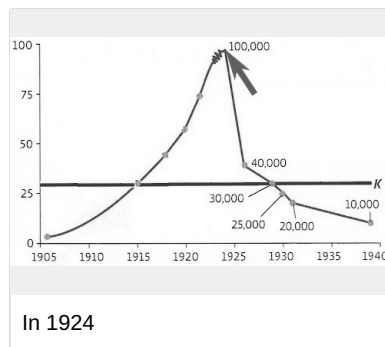
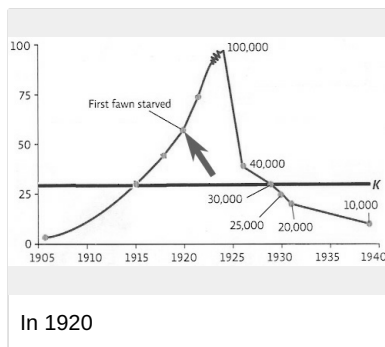
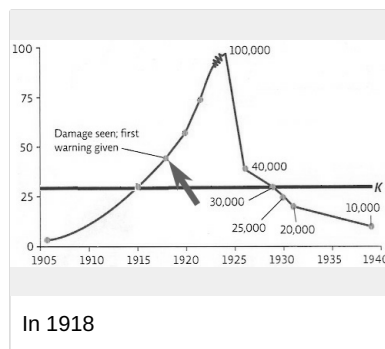
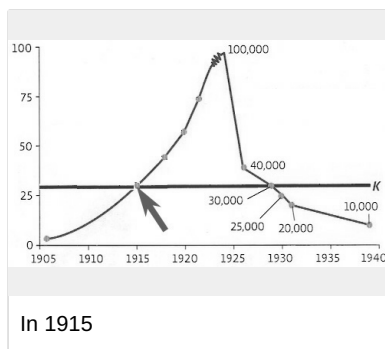
\* 14. What do you think were the TWO most important reasons for the overshoot and collapse of the Kaibab deer population?

- ☐ The Kaibab plateau was a closed area
- ☐ Strong growth in deer population because of loss of predators and hunting
- ☐ Unpredictable factors such as weather and disease
- ☐ Overgrazing
- ☐ Don't know

- \* 15. The graph below shows the overshoot and collapse of the Kaibab deer population in the early 20th century. (The red line marked K is the estimated carrying capacity of the Kaibab plateau in 1905.)



Which arrow indicates the year that overgrazing began? Choose ONE answer below.



\* 16. If you think an initial deer population of 50 allowed to grow without intervention is NOT sustainable, which of the following measures do you think would be MOST effective in making it sustainable? (Choose up to THREE.)

- ☐ Start with a 50% smaller herd size
- ☐ Decrease the birth rate of the deer using fertility reducing treatments
- ☐ Double the size of the deer park
- ☐ Plant more vegetation for the deer to eat
- ☐ Increase the death rate of the deer by introducing controlled culling or hunting, or reintroducing natural predators such as wolves
- ☐ Make sure that the deer population is never so big that it consumes more than the annual regrowth of vegetation
- ☐ I don't agree that the deer herd is unsustainable

\* 17. How difficult did you find this quiz?

Very easy	Easy	Manageable	Difficult	Very difficult
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 18. To what extent did you have to guess when answering questions on the following topics:

	I was very sure of my answer	I have some confidence in my answer	I had to guess
What sustainability means when managing the deer park	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identifying which graphs show sustainable growth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calculating expected growth of deer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calculating expected vegetation levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calculating the carrying capacity of the deer park	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Judging whether the deer herd is sustainable or not	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Choosing policies for sustainable management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deciding why the Kaibab deer herd grew unsustainably	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the Kaibab deer graph to judge when overgrazing began	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>