

Exercise walk-through

3.4

Carrying Capacity

AP Environmental Science

Carrying capacity

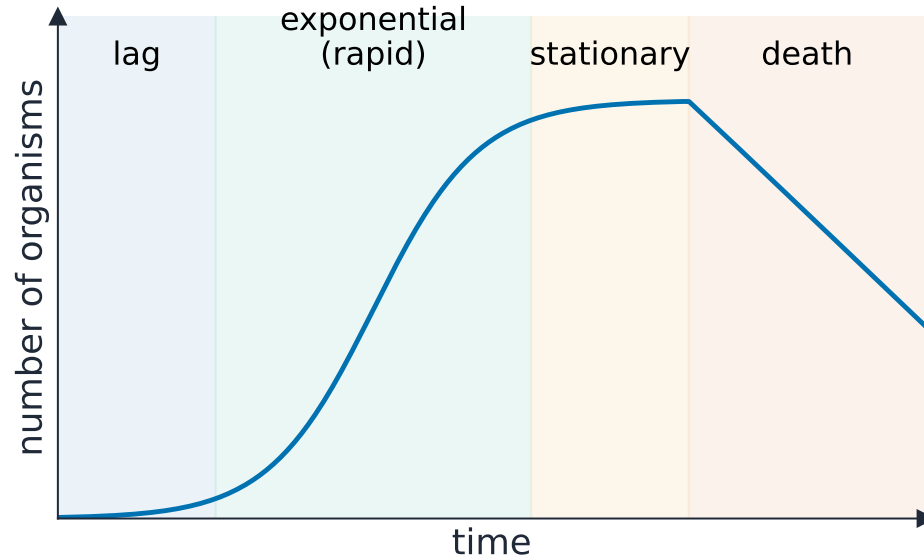
Carrying capacity K is the most an environment can support. Populations overshoot then die-off; limiting factors set K .

J-curve $\rightarrow$ S-curve; K itself shifts with the weather.



Carrying capacity limits wildlife populations

Population growth levels off at the carrying



Population growth levels off at the carrying capacity of the environment

Carrying capacity, and what happens past it

carrying capacity

K – the maximum population an environment can support long-term

approaching K

growth slows as resources per individual fall – the logistic curve flattens

overshoot

a population may exceed K when resources are temporarily abundant

then a die-off

the excess cannot be supported, and numbers crash – sometimes below K

what sets K

the scarcest resource: food, water, nesting sites, or space

and it moves

K is not a constant – a wet year or a new technology raises it

K is a property of the environment, not of the species. That is why a habitat's degradation lowers it even when the population has not changed.

Population Growth and Resource Availability

With abundant resources a population grows **exponentially** (*J*-curve).

As resources become limited, growth slows to **logistic** (*S*-curve), leveling at K .

Exercises 2.1-2.3

2.1 Define carrying capacity.

[1]

2.2 What is an overshoot?

[1]

2.3 Name one limiting factor.

[1]

Exercises 2.1-2.3

2.1 Define carrying capacity. [1]

2.1

- The maximum population an environment can support long-term
-

2.2 What is an overshoot? [1]

2.2

- When a population grows past its carrying capacity
-

2.3 Name one limiting factor. [1]

2.3

- Any one: food, water, space, disease

Exercise 3.1

3.1 When a population exceeds carrying capacity, the likely result is a

[1]

☐

A continued rise

B die-off (crash)

C stable population

D new carrying capacity

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3.1 B

- a die-off (crash)

Exercise 3.2 (a)

3.2 A deer population grows rapidly and exceeds the food supply.

(a) Name what happens to the population next, and why.

[2]

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(a) Name what happens to the population next, and why.

[2]

(a)

- A die-off (crash) – resources are used faster than they renew, so many individuals die

Exercise 3.2 (b)

3.2 A deer population grows rapidly and exceeds the food supply.

(b) State one density-dependent limiting factor.

[1]

Exercise 3.2 (b)

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(b) State one density-dependent limiting factor.

[1]

(b)

- Any one: competition, disease

Exercise 3.3

3.3 Explain how density-dependent factors keep a population near its carrying capacity.[2]

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3.3

- As density rises, competition and disease increase, raising deaths and lowering births; this pushes the population back down toward K