

Exercise walk-through

Carrying Capacity ■ 3.4

eXercise

You must be able to

- define **carrying capacity** 环境容纳量 K
- explain **overshoot** 超载 and **die-off** 骤减
- describe **limiting factors** 限制因素

Method — Carrying capacity

Carrying capacity (K) is the maximum population an environment can support long-term, set by **limiting factors** (food, water, space, disease).

Method — Overshoot and die-off

If a population grows **past** K (an **overshoot**), resources are used up faster than they renew, causing a **die-off** (crash) back below K .

Method — Limiting factors

Density-dependent factors (competition, disease) intensify as the population grows and pull it toward K . **Density-independent** factors (weather) can also cap it.

Method — A worked scenario

Deer multiply past the food supply (overshoot); winter food runs out and many starve (die-off), dropping the population below carrying capacity.

Practice 2.1 ■ 1 mark

Define carrying capacity.

Solution 2.1

Worked steps

The maximum population an environment can support long-term **B1**.

Practice 2.2 ■ 1 mark

What is an overshoot?

Solution 2.2

Worked steps

When a population grows past its carrying capacity **B1**.

Practice 2.3 ■ 1 mark

Name one limiting factor.

Solution 2.3

Worked steps

Any one: food, water, space, disease **B1**.

Exam-style 3.1 ■ 1 mark

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

A continued rise

B die-off (crash)

C stable population

D new carrying capacity

Solution 3.1

A continued rise

B die-off (crash) 

C stable population

D new carrying capacity

Worked steps

B — a die-off (crash).

Exam-style 3.2 ■ 2 marks

A deer population grows rapidly and exceeds the food supply.

- (a) Name what happens to the population next, and why.
- (b) State one density-dependent limiting factor.

Solution 3.2

Method: Limiting factors

Worked steps

(a) A die-off (crash) — resources are used faster than they renew, so many individuals die **M1** **A1**. (b) Any one: competition, disease **B1**.

Exam-style 3.3 ■ 2 marks

Explain how density-dependent factors keep a population near its carrying capacity.

Solution 3.3

Worked steps

As density rises, competition and disease increase, raising deaths and lowering births; this pushes the population back down toward K **M1** **A1**.