Impact of environmental change

4.7.2.4 · Ecology · revision notes

How changes in temperature, water availability and the gases in the atmosphere change where species are found. You will usually be given data and asked to explain or evaluate a change in distribution. This subtopic is in GCSE Biology only (not Combined Science) and is Higher tier only.

Key facts

- Distribution = where a species is found
- Types of change: seasonal, geographic, human interaction
- Less water → species that need wet conditions are lost from an area
- Correlation does not prove causation
- Environmental changes: temperature, water availability, atmospheric gases
- Warmer climate → some species move further from the equator or uphill
- Sulfur dioxide pollution → fewer lichens

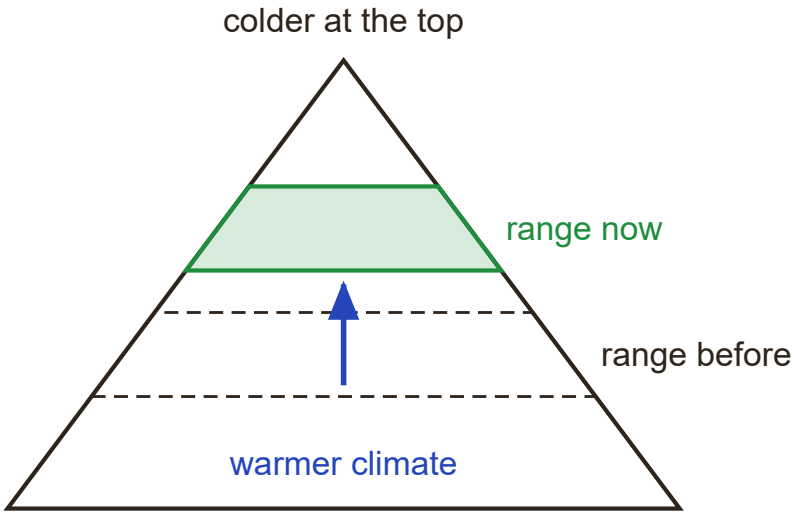
Notes

What changes distribution

- The **distribution** of a species is where it is found. When the environment changes, the distributions of species change too.
- The changes to know are in: **temperature**; **availability of water**; **composition of atmospheric gases**.
- A change can be **seasonal** (through the year), **geographic** (from place to place) or the result of **human interaction**.

Examples

- **Seasonal**: some birds migrate to warmer places when temperatures fall and food becomes scarce in winter, and return in spring.
- **Geographic**: conditions differ from place to place, e.g. it is colder higher up a mountain, so some plants grow only on the lower slopes.
- **Human interaction**: global warming is making many areas warmer, so some species are now found further from the equator or higher up mountains than before.



As the climate warms, a species that needs cool conditions moves higher up the mountain.

- Water: draining wetlands or taking water from rivers reduces the water available, so species that need wet conditions disappear from the area.
- Atmospheric gases: many lichens cannot survive where there is a lot of sulfur dioxide in the air, so they were rare in polluted cities and return when the air becomes cleaner.

Explaining and evaluating

- To explain a change, link the factor to survival and reproduction: a species spreads into areas where conditions now suit it and dies out where they no longer do.
- To evaluate, say whether the data supports the conclusion and give other possible explanations (another factor may have changed too).
- Judge the data: how many sites, over how many years, and whether the change is large compared with normal year-to-year variation.
- A correlation between two changes does not prove that one causes the other.

How to answer each type of question

Describe a change in distribution from data

2 marks | **Grade 6**

1. Say how the range or numbers of the species changed.
2. Use values or places from the map, table or graph.
3. Compare the start and end of the time period.

Example. Ecologists recorded whether a species of dragonfly was present in 100 survey squares in the north of a country and 100 survey squares in the south.

Region	Squares with the dragonfly in 1990	Squares with the dragonfly in 2020
North	12	41
South	88	88

Describe the change in the distribution of the dragonfly. (2 marks)

Model answer. The dragonfly spread north / was found in more northern squares (1). It rose from 12 to 41 squares in the north, while it stayed at 88 squares in the south (1).

Suggest or explain the cause of a change

2 to 3 marks | **Grade 7**

1. Identify the environmental change (temperature, water or gases).
2. Explain how it affects the survival or reproduction of the species.
3. Link this to the new distribution.

Example. Between 1990 and 2020, a species of dragonfly spread into more of the north of a country. Over the same period, average temperatures in the north rose by 1 °C.
Suggest how the temperature rise could explain the change in the dragonfly's distribution. (3 marks)

Model answer. The north became warmer (1). So more dragonflies (or their larvae) could survive and reproduce there (1). So the species could live further north than before (1).

Evaluate a conclusion about environmental change

4 to 6 marks | Grade 8

1. State what in the data supports the conclusion.
2. State what else could explain it (other factors) and that correlation is not proof.
3. Comment on the data: number of sites, time period, how it was collected.
4. Finish with a judgement and a reason.

Example. Between 1990 and 2020, average temperatures in the north of a country rose by 1 °C. Over the same period, a species of dragonfly was found in more survey squares in the north (41 squares instead of 12).
A student concludes: 'Global warming caused the dragonfly to spread north.'
Evaluate this conclusion. (4 marks)

Model answer. Any four from: the spread north happened over the same period as the temperature rise, which supports the conclusion (1); but this is only a correlation, which does not prove cause (1); other factors may have changed, e.g. more ponds were dug or water pollution fell (1); more people may have been recording dragonflies in 2020 than in 1990 (1); judgement: the data is consistent with warming being a cause but does not prove it (1).

Don't lose marks

- Treating a correlation as proof that one change caused another.
- Saying individual animals 'adapt' to new conditions. Distributions change because individuals survive and breed where conditions suit them.
- Describing data without quoting any numbers.
- Giving a conclusion in an 'evaluate' question with no reasons for and against.

More tips

Memory tricks

- What changes, TWG: Temperature, Water, Gases.
- Why it changes, SGH: Seasonal, Geographic, Human.
- Evaluate = for + against + judgement.

Exam technique

- In 'evaluate' questions, always finish with a judgement.
- Look for other variables that could have changed at the same time, and name one.
- Say whether there is enough data: how many sites, how many years, how it was collected.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 5 **Name environmental changes that affect distribution**
Temperature, availability of water and the composition of atmospheric gases.

Grade 6 **Classify changes as seasonal, geographic or human**

Seasonal changes follow the year, geographic changes vary from place to place, and some changes are caused by human activity.

Grade 6

Describe a change in distribution from data

Say where the species is found now compared with before, using values from the map, table or graph.

Grade 7

Explain a change in a species' distribution

Link the environmental change to survival and reproduction, e.g. warmer winters let a species survive further north.

Grade 8

Evaluate data on distribution changes

Say what the data shows, whether it supports the claim, and what other factors or limitations there are.

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