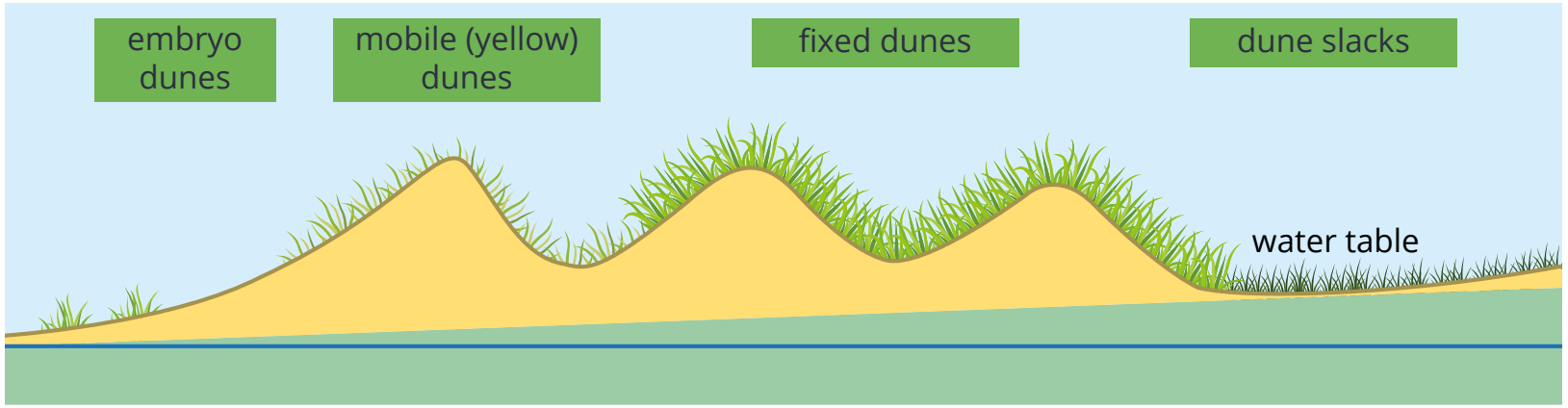
Suitable strategies for sampling in a sand dune

Ynyslas sand dunes, Ceredigion

Theoretical context: zonation



Sea rocket is a pioneer species of the embryo dunes.

Marram dominates the mobile dunes.

Shrubby plants like this bramble grow in the fixed dunes.

Plants that tolerate flooding, like this fen orchid, grow in the dune slacks.

Environmental gradients

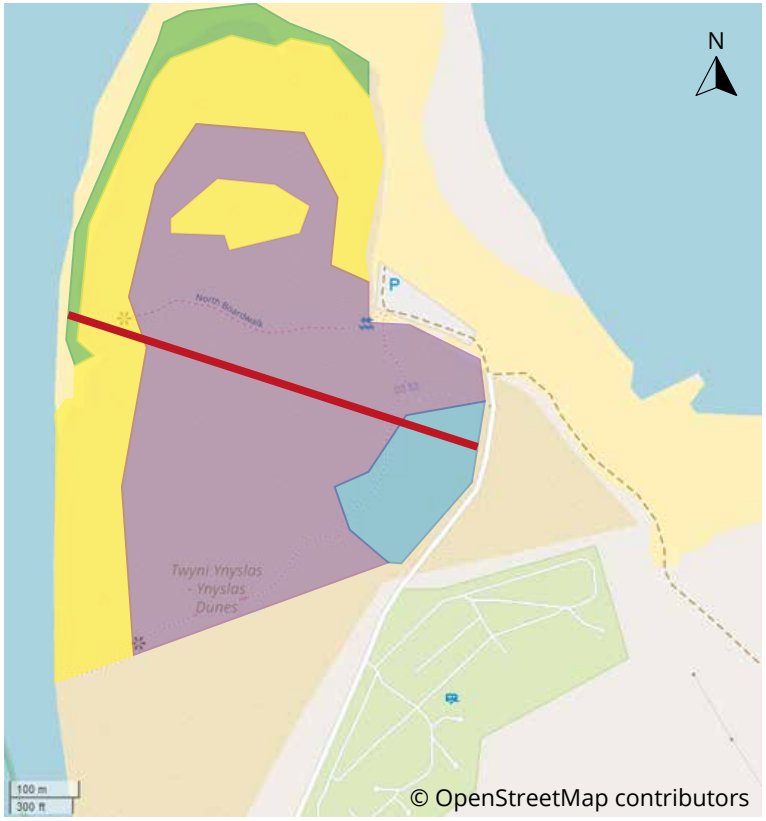
Environmental gradient is a term that is used to describe how data changes over distance. It is possible to investigate a number of environmental gradients in a sand dune environment. For example, it is possible to investigate how each of the following variables changes with distance from the strand line/top of the beach:

- Soil colour, moisture content or soil pH
- Wind speed
- Temperature
- Plant species
- Plant coverage

Sampling along a line (or using a transect) is the most effective strategy to investigate environmental gradients.

Sampling along a line (or transect)

Sampling along the red line would mean that changes along the environmental gradient from the embryo dunes to the dune slacks could be investigated.



Embryo dunes

Mobile dunes

Fixed dunes

Dune slacks

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Key considerations

Does the line follow the environmental gradient? In this case, the line needs to be roughly parallel to the prevailing wind.

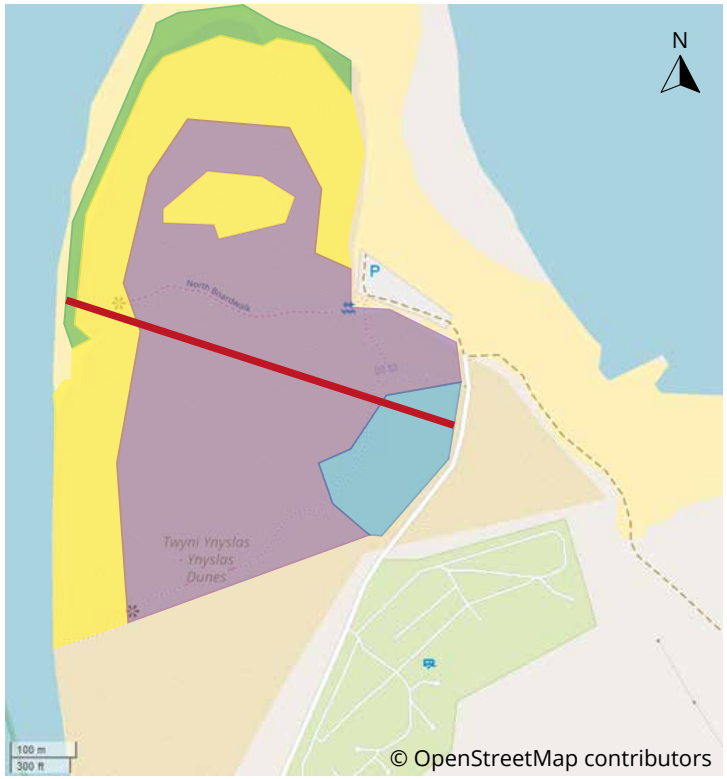
Is the line long enough? In this case, does it cut across each zone of the ecosystem?

Embryo dunes

Mobile dunes

Fixed dunes

Dune slacks



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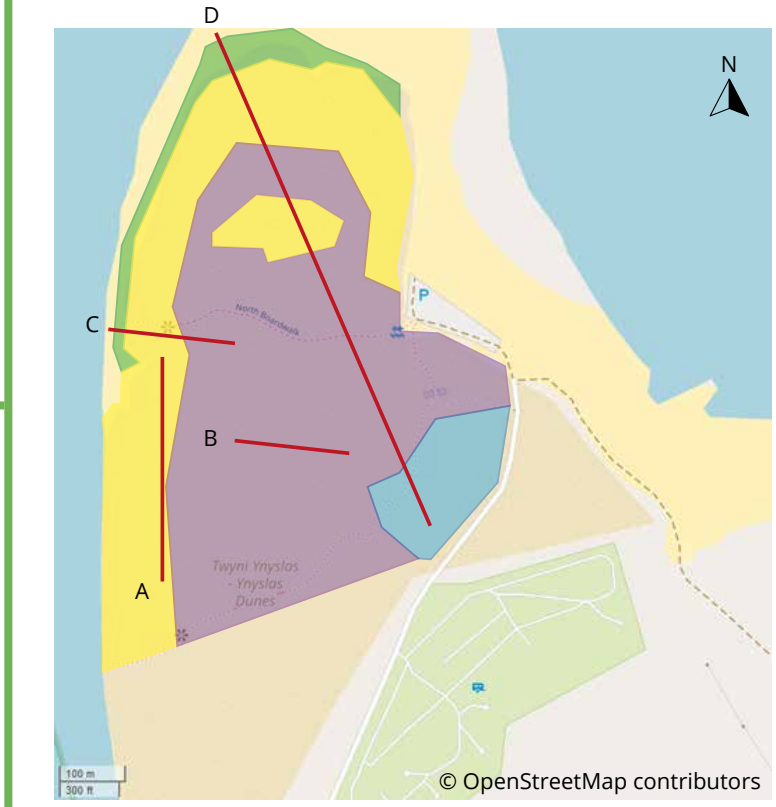
Review

A student wants to investigate the concept of zonation and how these zones relate to environmental gradients.

a) Which of the proposed transects is the most suitable?

b) Explain why each of the other proposed transects are unsuitable.



Embryo dunes
Mobile dunes
Fixed dunes
Dune slacks

Ynyslas sand dunes, Ceredigion

Point sampling along a line

The type of data you sample will depend on your hypothesis or research question, but you could sample data such as wind speed, soil colour, soil pH or soil moisture at **points** along the transect.

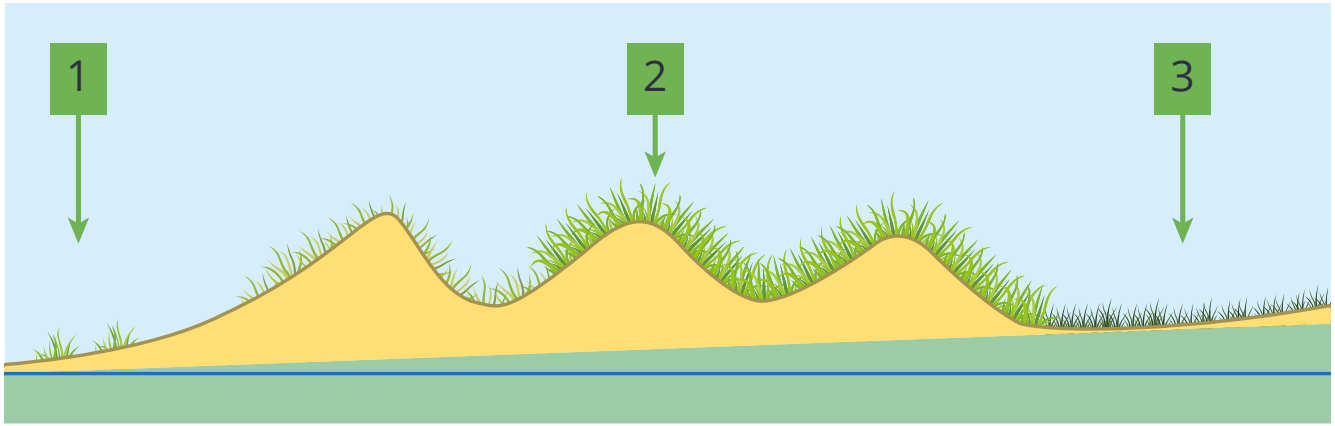
You need to decide:

- whether to use a systematic, random or stratified strategy to select the points;
- the frequency of the points, i.e. how far apart they are.

Frequency of sample points

The frequency of sample points along the transect will depend on factors such as:

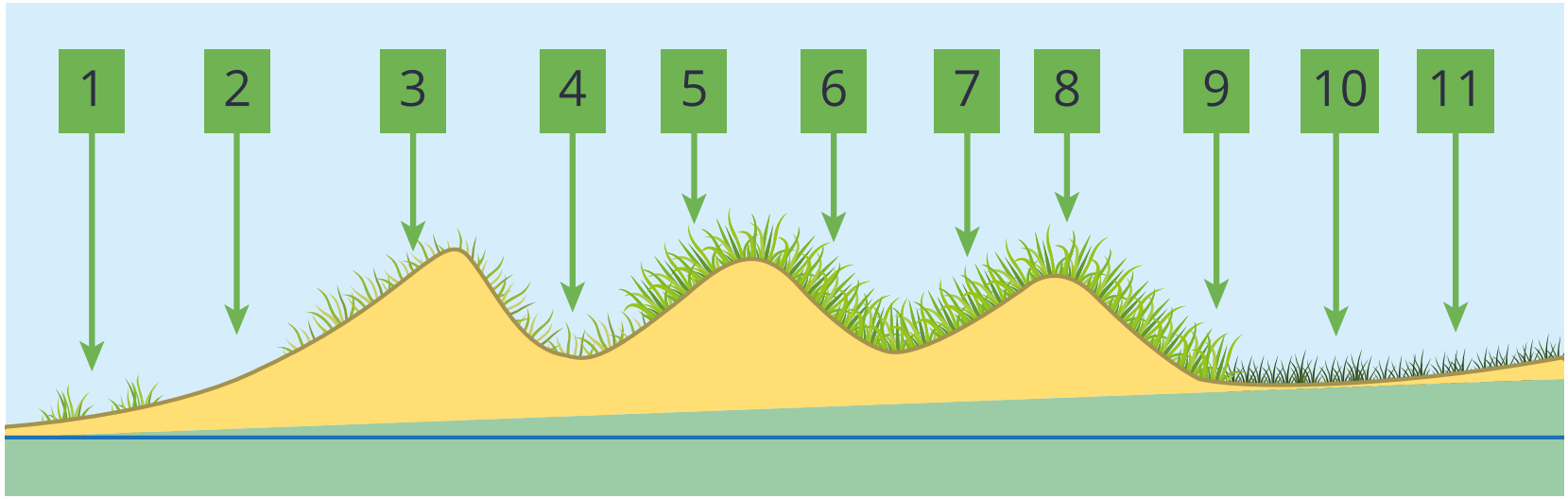
- the amount of time available for the investigation
- whether variables change suddenly or slowly along the environmental gradient.



In this example, with only three equally spaced sample points, the variations that have created the development of the mobile dunes between sample 1 and 2 have been missed completely.

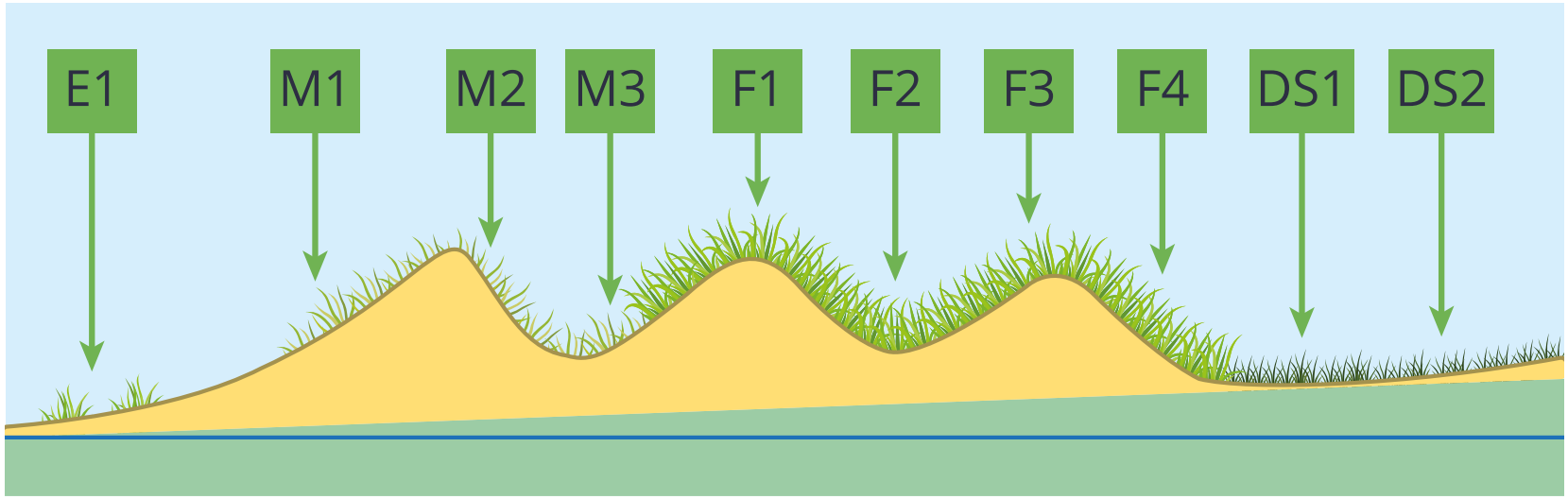
One solution is to increase the frequency of sample points so that variations over short distances can be observed.

Frequency of sample points



In this example, the length of the transect has been divided by 10 to give 11 equally spaced sample points. There are now sample points in each zone, but sample points could still be as much as 80 metres apart and smaller variations (for example in the embryo dunes) might still be missed.

Stratified sampling



This is an alternative method in which stratified sampling along the line is being used. The student has used secondary sources, including an aerial photo, to estimate the area covered by each zone. Sample points are then allocated in proportion to each zone.

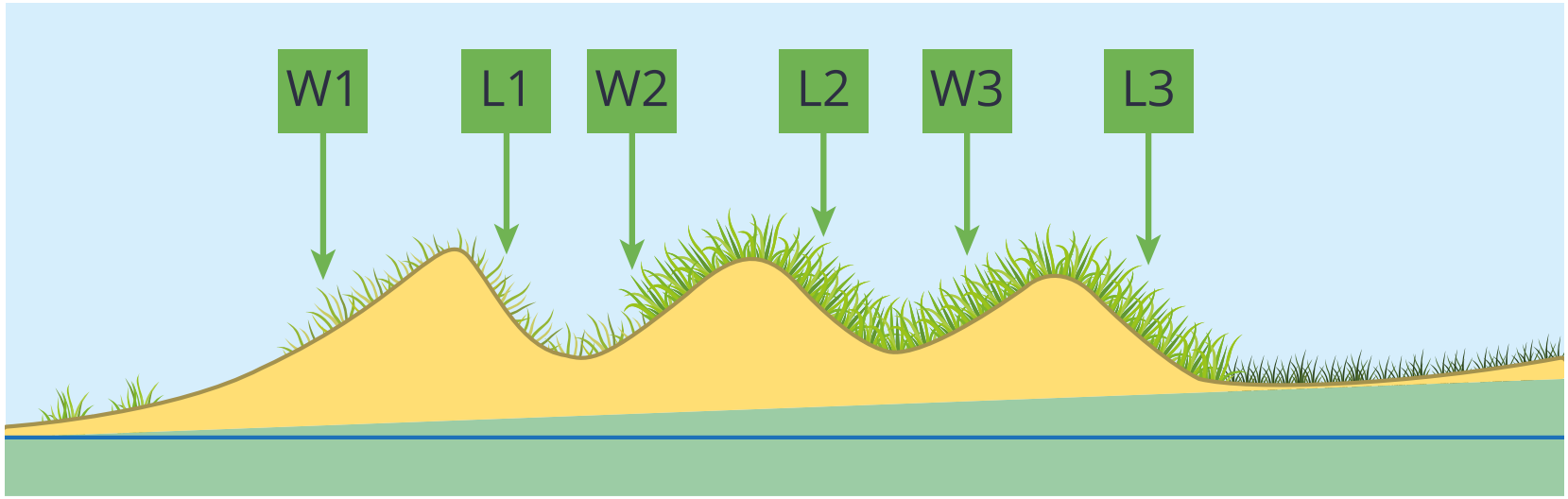
This strategy ensures that at least one sample point is within the embryo dunes.

Research prior to the fieldtrip suggests that the zones occur roughly in these proportions.

Embryo dunes
Mobile dunes
Fixed dunes
Dune slacks

Zone	proportion
Embryo	10%
Mobile	30%
Fixed	40%
Dune slacks	20%

Stratified sampling (example 2)

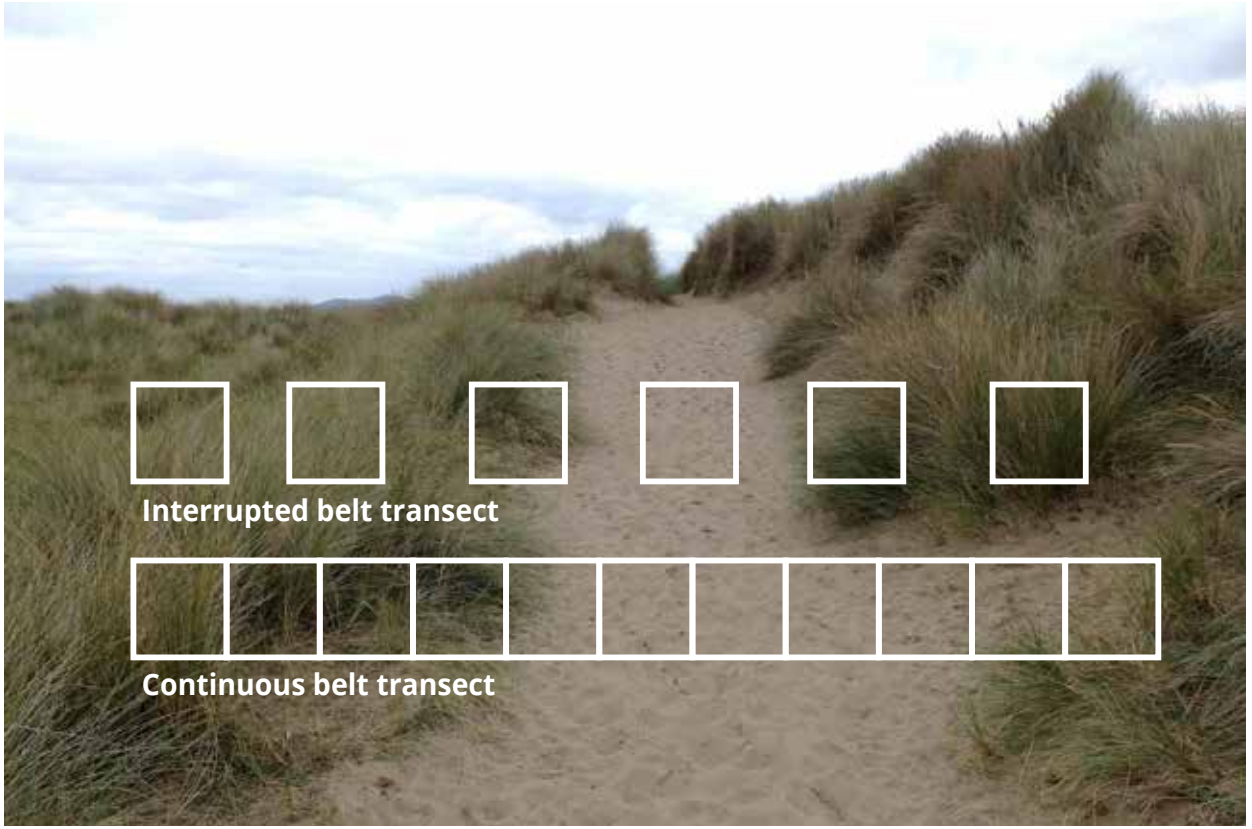


The aim is to examine the difference between windward and leeward facing slopes.

Square frames (quadrats) are used to estimate per cent plant cover. This strategy is used to sample areas along a line. The use of quadrats along a sample line is known as a **belt transect**.

This diagram illustrates two methods of belt transect sampling. The frequency of sample sites along an interrupted belt transect will depend on factors such as:

- time available for the investigation
- whether variables change suddenly or slowly along the environmental gradient.



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Review

A student wants to investigate zonation and succession using a transect. Suggest where the transect should start.

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Review

A student wants to investigate vegetation cover in the embryo dunes. Which is the most appropriate strategy?

A: point sampling every 5 metres

B: an interrupted belt transect

C: a continuous belt transect

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