Sand dune coastal environment: Studland Bay

Sand dunes are common features of low-lying stretches of coastline in the UK and elsewhere in the world. They form in places where there is a plentiful supply of sand, a broad beach that dries out at low tide and a dominant onshore wind direction. They owe their formation to the wind. Along with salt marshes, sand dunes are an excellent example of a coastal environment and they provide a variety of unique habitats for living organisms.

- Studland Bay is an area of sand dunes just to the north of Swanage on the east coast of the Isle of Purbeck in Dorset and is popular with tourists. It can be accessed by ferry from the desirable area of Sandbanks in Poole during the summer. It is only a few minutes drive from the resort of Swanage and most visitors arrive by car.
- The sand is blown onshore when sandbanks just offshore become exposed and dry out at low tide.

The development of the sand dune ecosystem at Studland Bay

Look at Figure 1. It shows a cross-section, or transect, through a typical area of sand dunes, such as Studland. Notice that a number of changes take place as the distance between the sand dune and the sea increases. The main change is in the amount and type of vegetation that grows on the sand dunes. This gradual change in vegetation is called a vegetation succession.

1 To start with, sand accumulates on the sheltered side of an obstacle such as a rock or a piece of driftwood. These small deposits of sand join together and grow to form embryo dunes (see Figure 1). Plants that can tolerate the dry and salty conditions – such as sea rocket – begin to colonise these early dunes.

2 As the sand becomes more stable larger foredunes will be formed. Plants such as marram grass (Figure 2) start to colonise these dunes. Marram grass is extremely well suited to sand dunes. Its long roots seek fresh water deep below the surface and its tough stems help to bind the sand together. Marram grass is folded to reduce transpiration in windy areas. As sand buries it, it is actually stimulated to grow taller. In time, these dunes develop to form tall, steep-sided yellow dunes.

3 Gradually, the environmental conditions start to improve. Dead plants add nutrients to the soil and the environmental conditions become less extreme. New species of vegetation, such as gorse and brambles start to grow forming a range of habitats for butterflies and insects, birds (e.g. the ringed plover) and small animals (e.g. rabbits and stoats). The darker, richer soils with a higher organic content account for the name grey dunes. Almost completely covered by vegetation, these dunes are more stable and are sometimes called fixed dunes.
4 Strong winds and trampling by humans can cause hollows or depressions to form in places. These are called 'blowouts'. Occasionally the base of the hollow may reach the water table. A waterlogged area, called a dune slack, will form here with a completely different range of plants and animals, such as orchids and creeping willow. Semi-aquatic animals such as frogs may be found here.

5 After a few hundred years, shrubs and trees will become established on the sand dunes. At this point, the vegetation succession is said to have reached its climatic climax. In the UK typical trees would be oaks or pines.

Management issues

Studland beaches are one of the most popular beaches in Britain at any one time in summer there can be as many as 25,000 people on the beach a day, evidently there is an impact. The impacts include:

- The nature reserve is an area of sand dunes. These are dynamic, but often unstable and vulnerable environments.
- Areas such as this are home to rare species of plants and birds.
- The area is attractive to tourists because of the dunes and the wide, sandy beach. The beach can get very crowded in summer months.
- Visitors need somewhere to park and also demand other facilities, such as paths and public toilets.
- Tourists bring their problems such as litter and fire hazards (caused by barbecues and cigarette ends).
- Dune erosion and destabilisation
- Footpath erosion
- Litter and dog mess
- Fire
- Species disturbance

All these competing demands need to be handled sensitively to ensure that the sand dunes are managed in a sustainable way for the future.
Sustainable management at Studland

Studland Beach and Nature Reserve is owned by the National Trust. This gives the area special conservation status and prevents large-scale developments taking place.

Footpaths are clearly signed and boardwalks have been constructed to minimise the effects of trampling. Blowouts are fenced off and replanted with marram grass to help stabilise the sand. Information boards and a Visitors Centre educate and inform visitors of the need to respect the natural environment.

Through continued monitoring, education and community involvement, the sand dunes at Studland will continue to be a special natural resource for future generations to enjoy.

Strategies to combat these include:

- Vulnerable areas and areas recently planted with marram grass (which is used to stabilise the dunes) are **fenced off** to limit access and damage.
- **Car parks** have been provided and people are not permitted to drive onto the beach.
- **Fire beaters** are positioned within the dune area in case of a fire.
- Facilities including a shop, café, toilets and litter bins are provided near the car parks to focus tourists into one area.
- Information boards **educate** visitors about the environment and how they can help to protect it.
- Dog mess bags and bins are provided as are recycling bins.
Figure 1: Transect across sand dunes

Figure 2: Marram grass growing on sand dunes
Chapter 7
Case study

Activities

1. Apart from a low-lying stretch of coastline, what else is needed for sand dunes to form at the coast?

2. Having read through this case study, can you suggest why sand dune ecosystems are special?

3. Make a large copy of Figure 1 on a plain sheet of paper. Leave enough room above the drawing for you to write detailed labels describing the characteristics and features associated with each element of the sand dune ecosystem, from the embryo dune to the mature dune.

4. Not all sand dunes have fully mature dunes with woodland. Can you suggest how human activities might prevent the development of mature trees?

5. Blowouts
   a) What is a blowout and how is it formed?
   b) Study Figure 2. Why is marram grass replanted to help restore a blowout?
   c) What else can be done to restore a blowout?

6. List the main pressures on the sand dunes at Studland Bay.

7. Modern management of areas such as Studland involves educating visitors.

8. How are visitors educated at Studland?

9. Do you think the education of visitors is a good idea? Explain your answer.

10. Complete the Studland Bay sand dunes case study sheet.