

Explanatory Notes

South West Coastal Monitoring (SWCM) is the data-gathering arm for the southwest of England for the National Network of Regional Coastal Monitoring Programmes (NNRCMP), which was founded in 2006 to provide a standard, repeatable and cost-effective method of monitoring the coastal environment in the region.

The programme operates from Beachley Point in Gloucestershire to Portland Bay in West Dorset on behalf of the region's maritime local authorities and coastal groups, as well as the Environment Agency and Defra, and is managed by Teignbridge District Council.

Berrow is a small village on the coast of Somerset, in south west England, close to the seaside resort of Burnham-on-Sea (Figure 1). A large part of the dunes, to the west of the village, are a designated Site of Special Scientific Interest, due to the wide variety of coastal habitats in the area. A marsh, or lagoon, lies to the south west of the dunes.

The Berrow Dunes are sandwiched between hard defences along the coast at Burnham-on-Sea and at Brean, and the dunes themselves protect many local amenities and are popular with visitors.

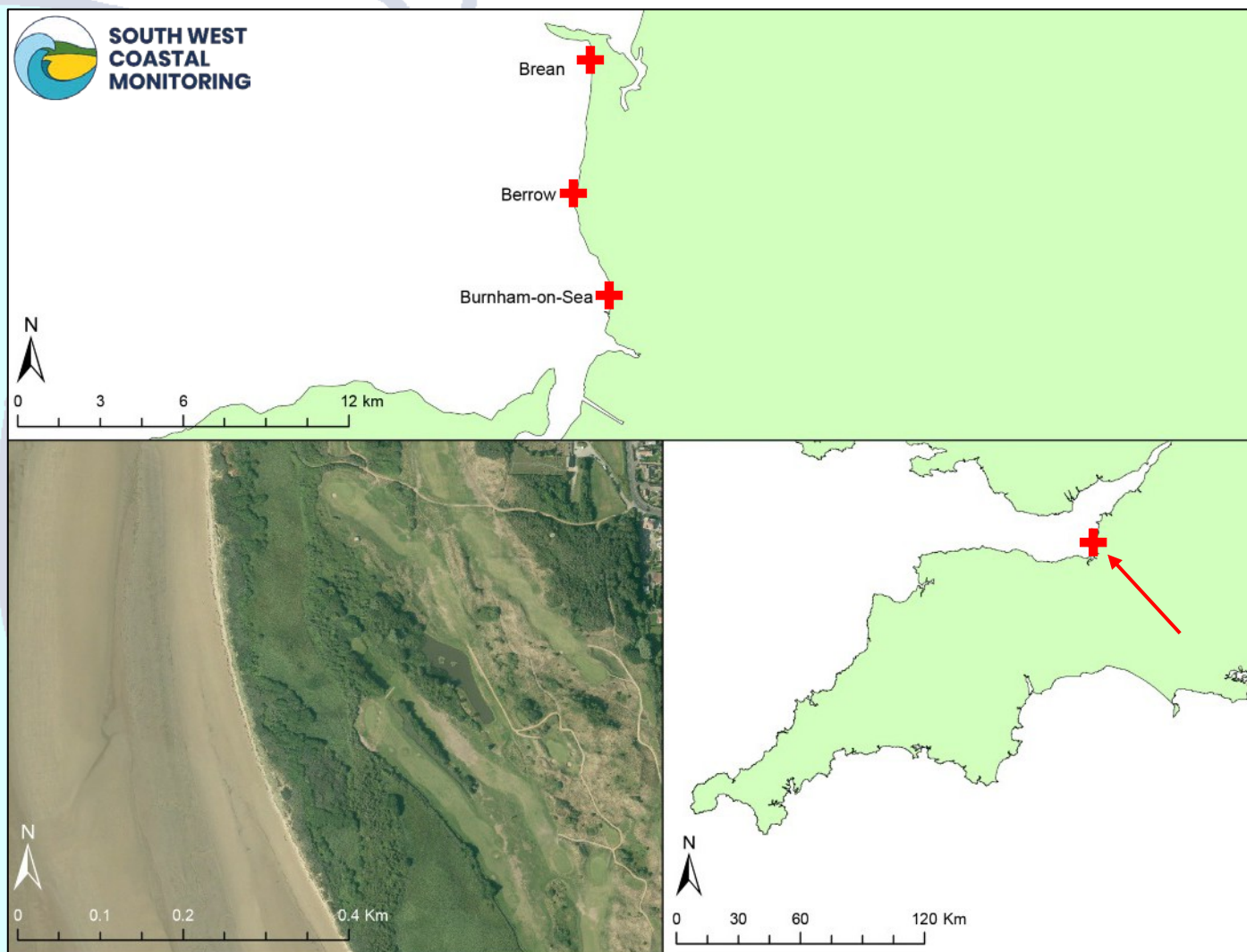


Figure 1 Top - a map identifying the location of Brean, Berrow, and Burnham-on-Sea in north Somerset. Bottom right - the location of Berrow Dunes relative to the southwest of England. Bottom left - an aerial image of Berrow Dunes.



Figure 2 Left - a photo of Berrow Dunes from the 2023 autumn interim, taken by AGS Surveys 2023. Right - zoomed in aerial imagery (2018) indicating the location of profile 7d02213.

It is difficult to determine long-term trends at the dunes, with both erosion and accretion being observed. The causes are equally difficult to determine, primarily because of high human impacts on the environment. Dunes are generally susceptible to erosion and the importance of those at Berrow are recognised by local conservation groups who carry out their own monitoring.

If you are considering a field trip to Berrow Dunes, be warned that at low tides a wide expanse of soft sand and mud is exposed. This means that it is dangerous to approach the water at low tide. The scientists working for South West Coastal Monitoring must also heed these warnings, so employ different techniques to those they would normally use when conducting surveys elsewhere where it's safer to walk. These techniques include greater use of aerial photography and LiDAR surveys. LiDAR, Light Detection and Ranging, is similar to Radar but uses laser light rather than radio waves to measure distance. LiDAR scanners can be fitted into light aircraft, often at the same time as aerial photography is being commissioned. Terrestrial laser scanners can be set on tripods, or vehicles such as quad bikes.

Berrow Dunes are situated on the south bank of the Severn Estuary, which, because of its shape, has one of the largest tidal ranges in the world (15 m).

Much of the area is a Site of Special Scientific Interest. Natural England states: "This site provides a wide range of coastal habitats which includes salt marsh, fore, grey and yellow dunes, stable dune grassland, dune slacks, scrub and a freshwater lagoon.

"Berrow Dunes supports one of the most diverse floras in Somerset: 272 species of flowering plant have been recorded. Two are nationally rare, while at least 10 have a restricted distribution in Britain. A rich invertebrate fauna with three nationally rare species and 21 notable species occurs, and the area is locally important for breeding and wintering birds. The dune system is of geomorphological interest."

SWCM's data is freely available on our website: southwest.coastalmonitoring.org



1 Berrow Dunes are located on the Somerset coast in the Severn Estuary. What is remarkable about the Severn Estuary?

SWCM has a tide gauge at the Second Severn Crossing (Fig.4) which broadcasts tide levels and wave heights directly to the website coastalmonitoring.org/realtimedata.

2 Have a look at the graphs and information from the tide gauge (Fig. 3) and see if you can work out the tidal range on the 13th January, 2024.

3 The 13th January, 2024 was a spring tide. Do you know what the difference is between a spring and neap tide?

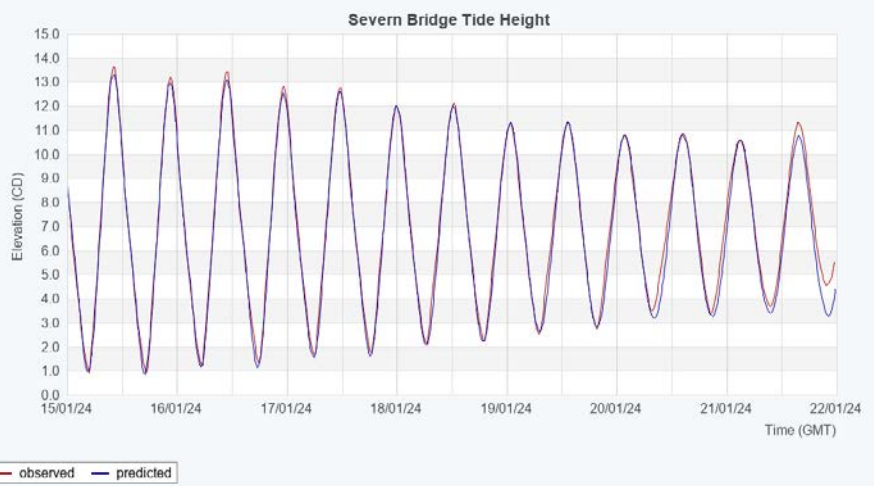


Figure 3 Top - daily tidal range, 13th January 2024 (GMT), at the Second Severn Crossing (SSC). Bottom - weekly tidal range, between 15th and the 22nd January 2024 (GMT), for the SSC. Predicted measurements are in blue and observed measurements are in red.



Figure 4 The Second Severn Crossing, where a Rosemount WaveRadar REX is installed to collect wave and tidal parameters.

Coastal Processes

schools case study:

Berrow Dunes, Somerset

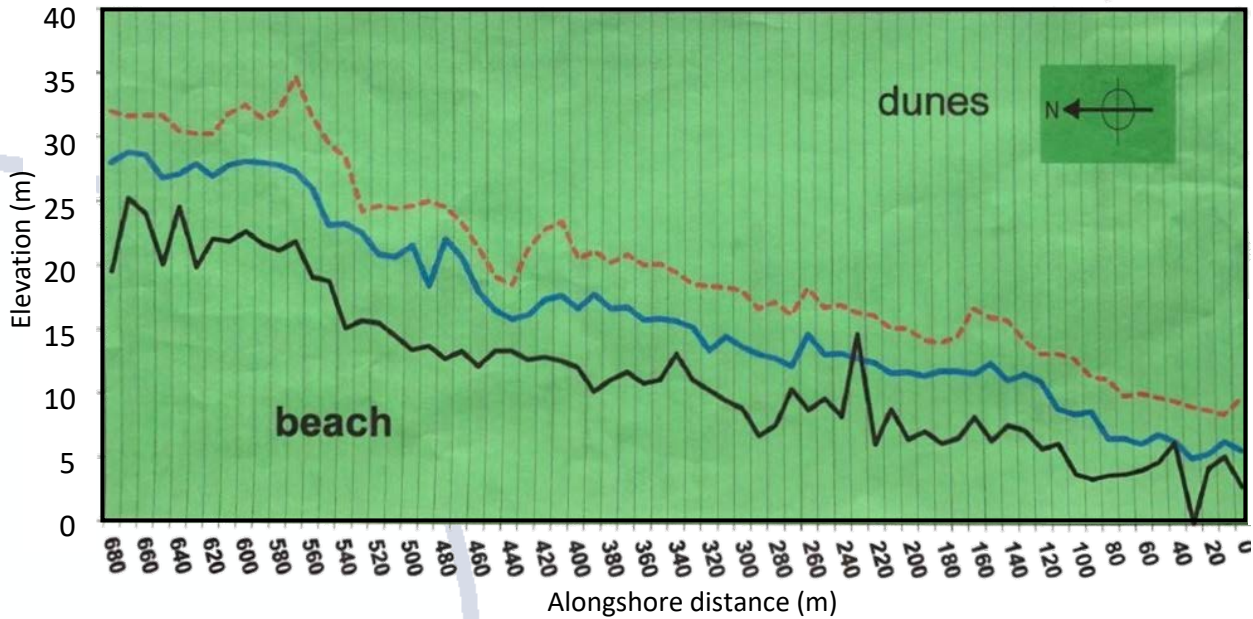


Figure 5 This graph shows the original data recorded in September 2009 (black line), October 2019 (blue line) and the latest survey in March 2020 (red dashed line). Carried out by the Berrow Conservation Group.

When the tide is all the way out, the sea can be up to 2 km from the dunes at Berrow and it can be very muddy.

4 Which is the best method to use to survey the entire beach:

- a) On foot
- b) On a quad bike
- c) Using LiDAR
- d) You cannot cover the whole beach; it is too big!

5 Why do you think that this method is most suitable for use here? What do you think are the dangers of working on such a big muddy beach?

6 Even though the beach can be very big and muddy there are sandy dunes at the back of the beach. Why do you think the dunes are important?



Figure 6 Surveyor and quad bike stuck in the mud at Burnham-on-Sea.



Figure 7 The northern end of Berrow dunes with wooden posts installed. Photo taken by AGS Surveys, 2023.

7 There is a line of posts, some of which can be seen in the photograph above (Figure 7), along the back of the beach, installed to stop the cars which are allowed to drive onto the beach harming the dunes. Can you think of a way you could use these posts to tell whether the dunes along this stretch of beach are eroding or accreting?

8 If it was found that the dunes were eroding how do you think this could be stopped?



Figure 6 The dune section at profile 7d02234, Berrow Dunes. Photo taken by AGS Surveys, 2023.

Should you use a quad bike to survey a muddy beach?

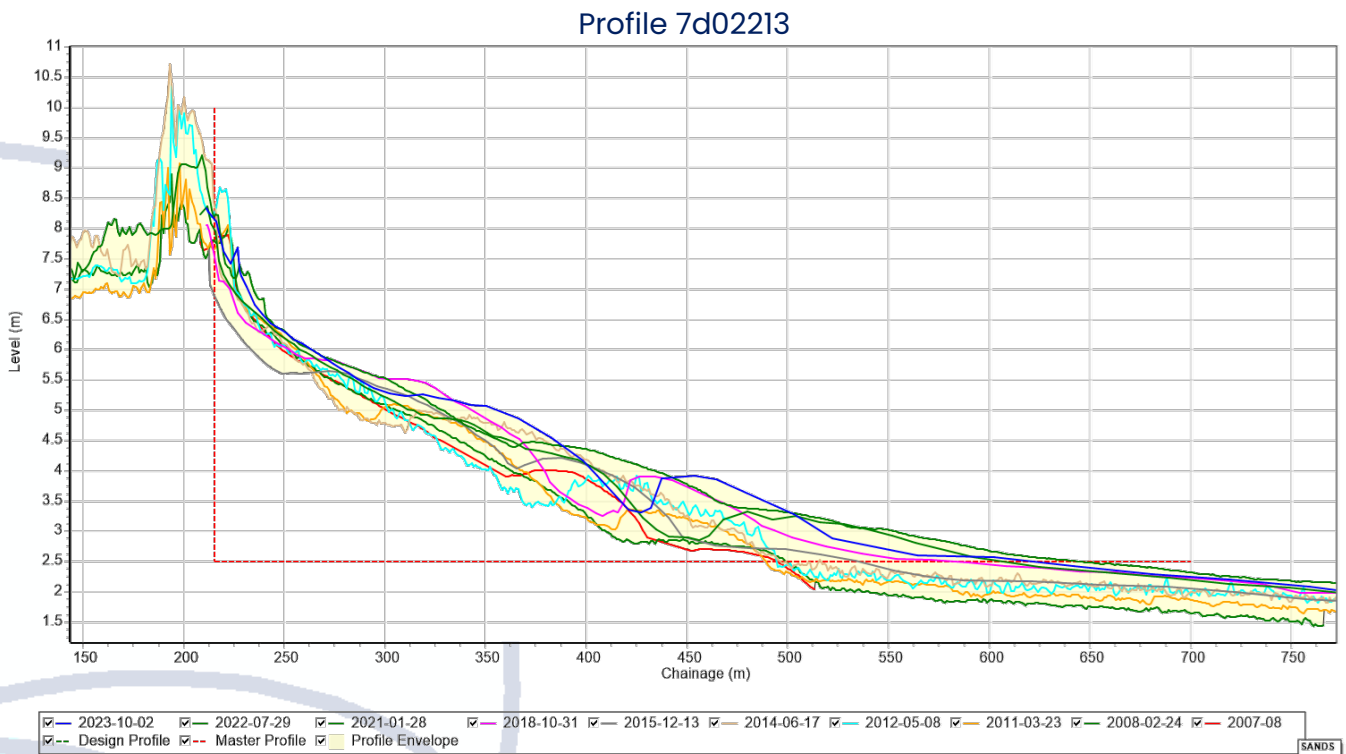


Figure 7 A side on graph depicting profile 7d02213 between the years 2007 and 2023.

9A The graph above (Figure 9) shows the beach profiles for profile 7d02213, looking at the years 2007, 2008, 2011, 2012, 2014, 2015, 2018, 2021, 2022, and 2023 measurements at Berrow Dunes. Look at the graph above, on the x-axis where the chainage reads 350 m. How much did the level of the beach rise or fall here, between 2012 and 2023?

B The image on the right shows the same profile captured by aerial photography showing the position of the dunes in the years 2008, 2010 2013, and 2018. From the aerial image, can you say what has happened to the dunes at this point?

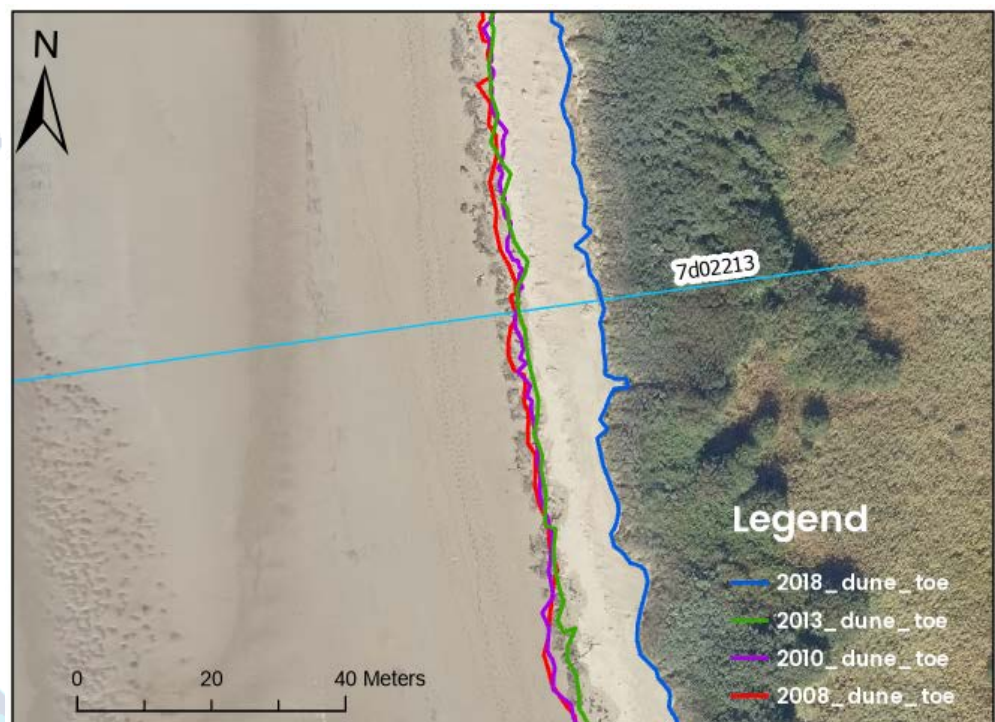


Figure 8 An aerial image, from 2018, of Berrow Dunes showing the dune toe for 2008 (red line), 2010 (purple line), 2013 (green line), and 2018 (blue line).