

# Coastal processes schools case study: Berrow Dunes, Somerset

Working for the South West Regional Coastal Monitoring Programme, the Plymouth Coastal Observatory measures and records detailed information on more than 2,000km of England's coastline from the Severn Estuary to Portland Bill



## Explanatory notes

The Plymouth Coastal Observatory is the data-gathering arm of the South West Regional Coastal Monitoring Programme, 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. 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. 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 the Plymouth Coastal Observatory 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 - high tides can be many metres higher than low tides.

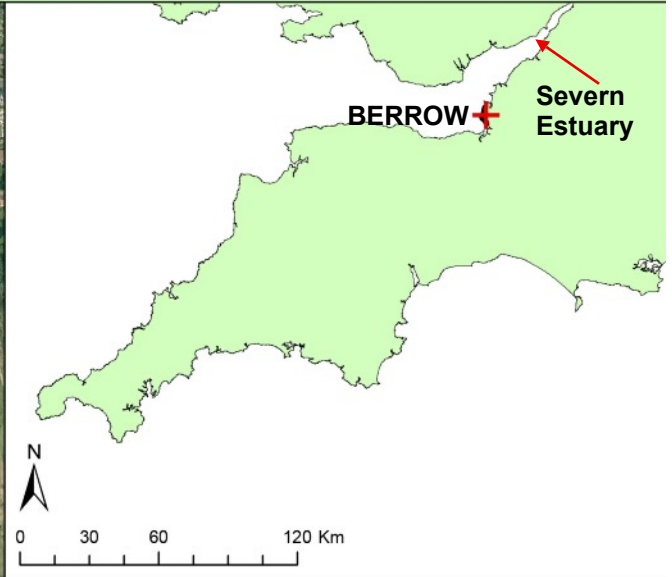
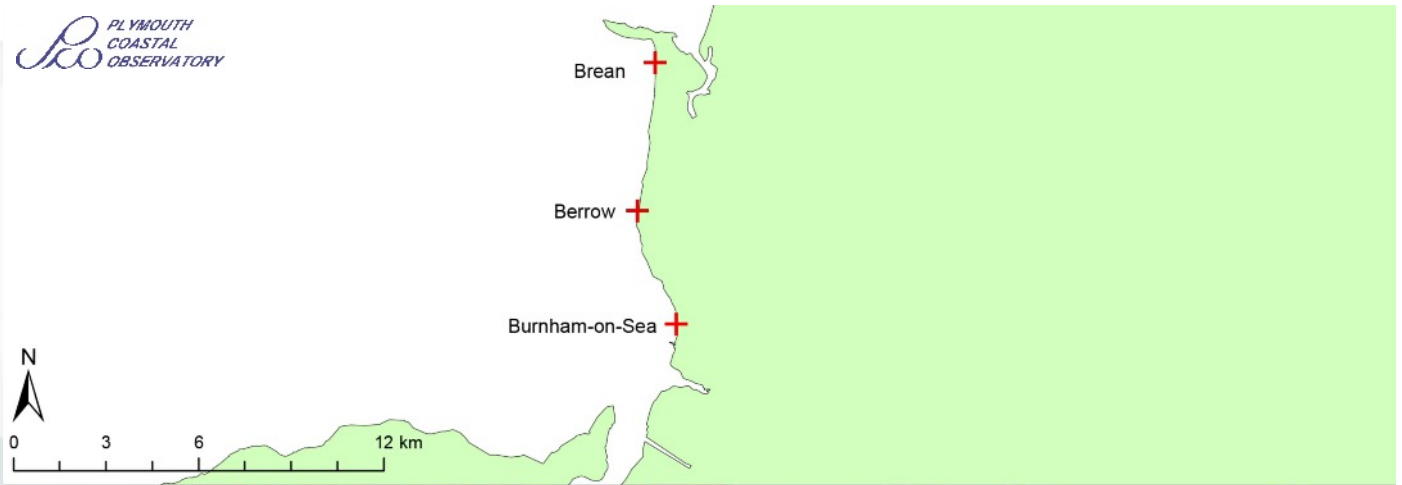
Much of the area is a Site of Special Scientific Interest. Natural England states: "This site provides a wide range of coastal habitats which includes salt marsh, fore, grey and yellow dunes, stable dune grassland, dune slacks, scrub and a freshwater lagoon.

"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."

The PCO's data is freely available. See the observatory's website [southwest.coastalmonitoring.org](http://southwest.coastalmonitoring.org) for more information.

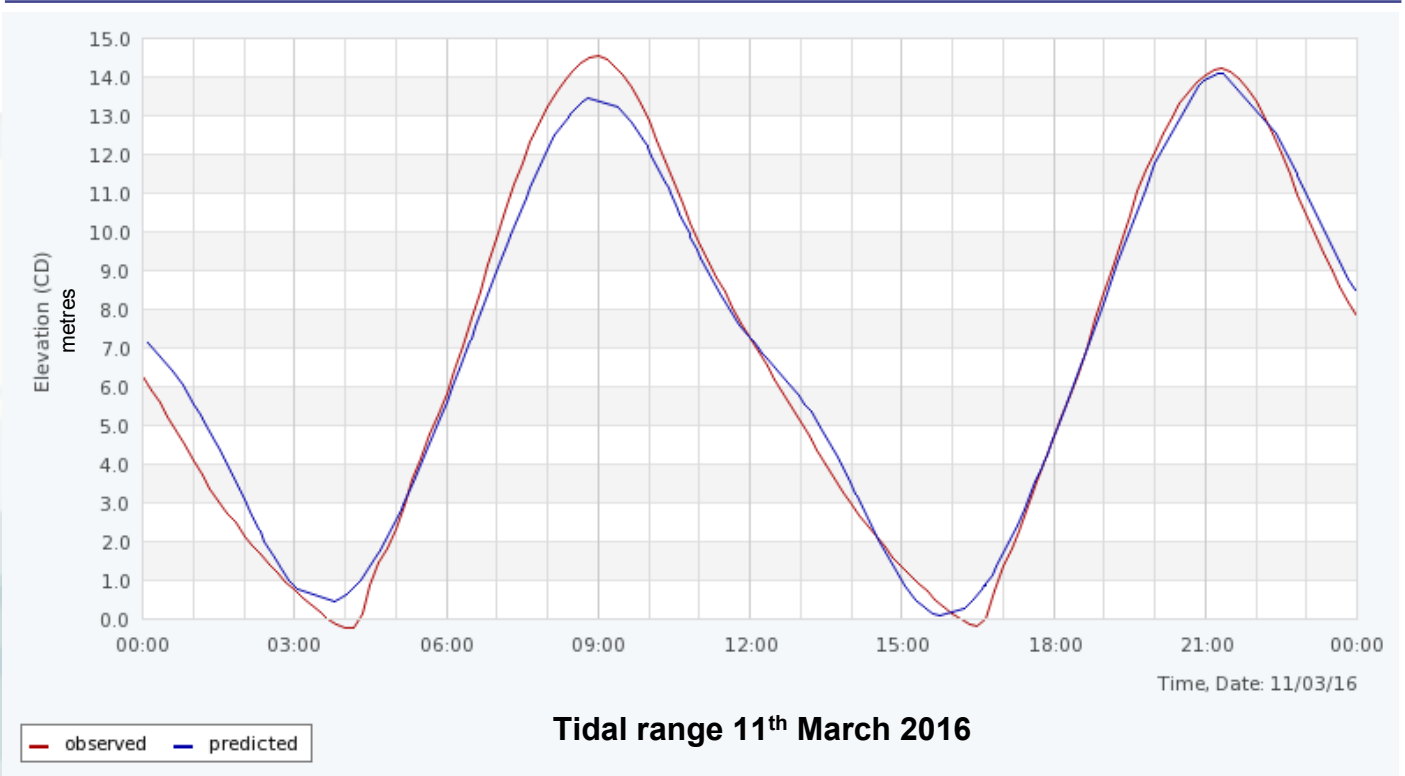
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2013 Beach profile 7d02213



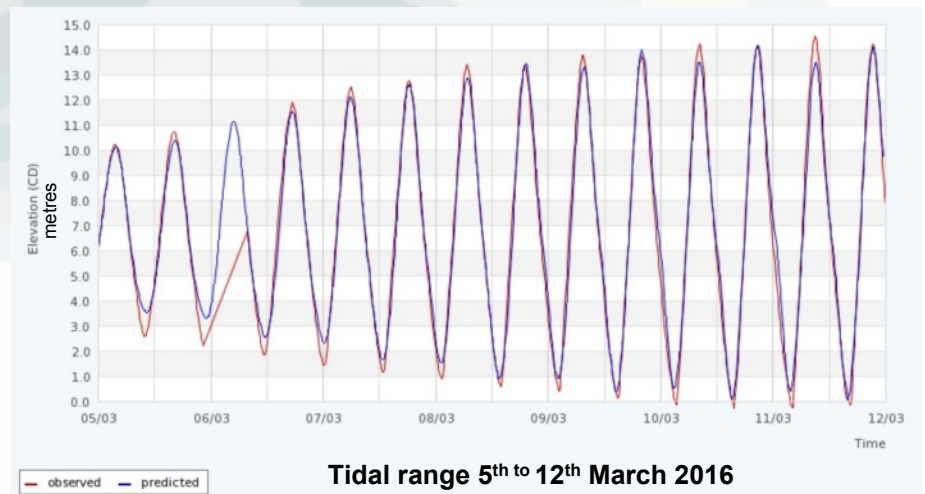


**1** Berrow Dunes are located on the Somerset coast in the Severn Estuary. What is remarkable about the Severn Estuary?

The Plymouth Coastal Observatory, part of the South West Regional Coastal Monitoring Programme, has a tide gauge at the Second Severn Crossing (Ail Groesfan Hafren in Welsh) which broadcasts tide levels and wave heights directly to the website [coastalmonitoring.org](http://coastalmonitoring.org).

**2** Have a look at the graphs and information from the tide gauge and see if you can work out the tidal range on the 11<sup>th</sup> March, 2016.

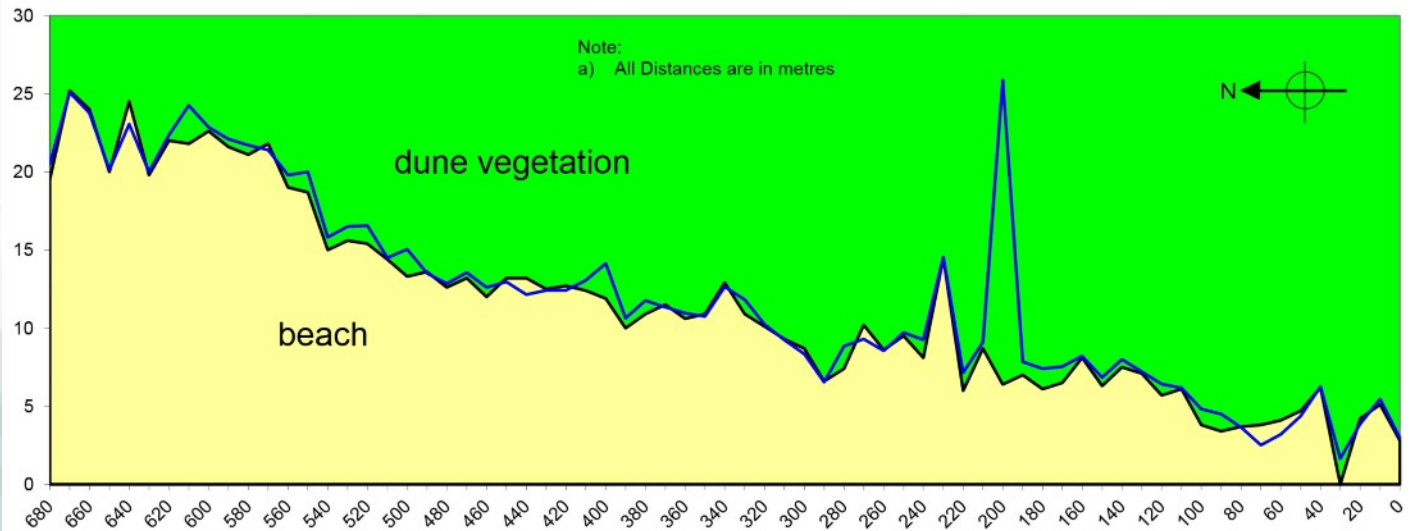
**3** The 11<sup>th</sup> March was a spring tide. Do you know what the difference is between a spring and neap tide?



### DUNE MONITORING

(Carried out by the Berrow Conservation Group)

This graph shows the original data recorded in September 2009 (black line) against the latest (third set of) data recorded in September 2010 (blue line)



When the tide is all the way out the sea can be up to two kilometres 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 can't cover the whole beach, it's 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?



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





**7** There is a line of posts, some of which can be seen in the photograph above, 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

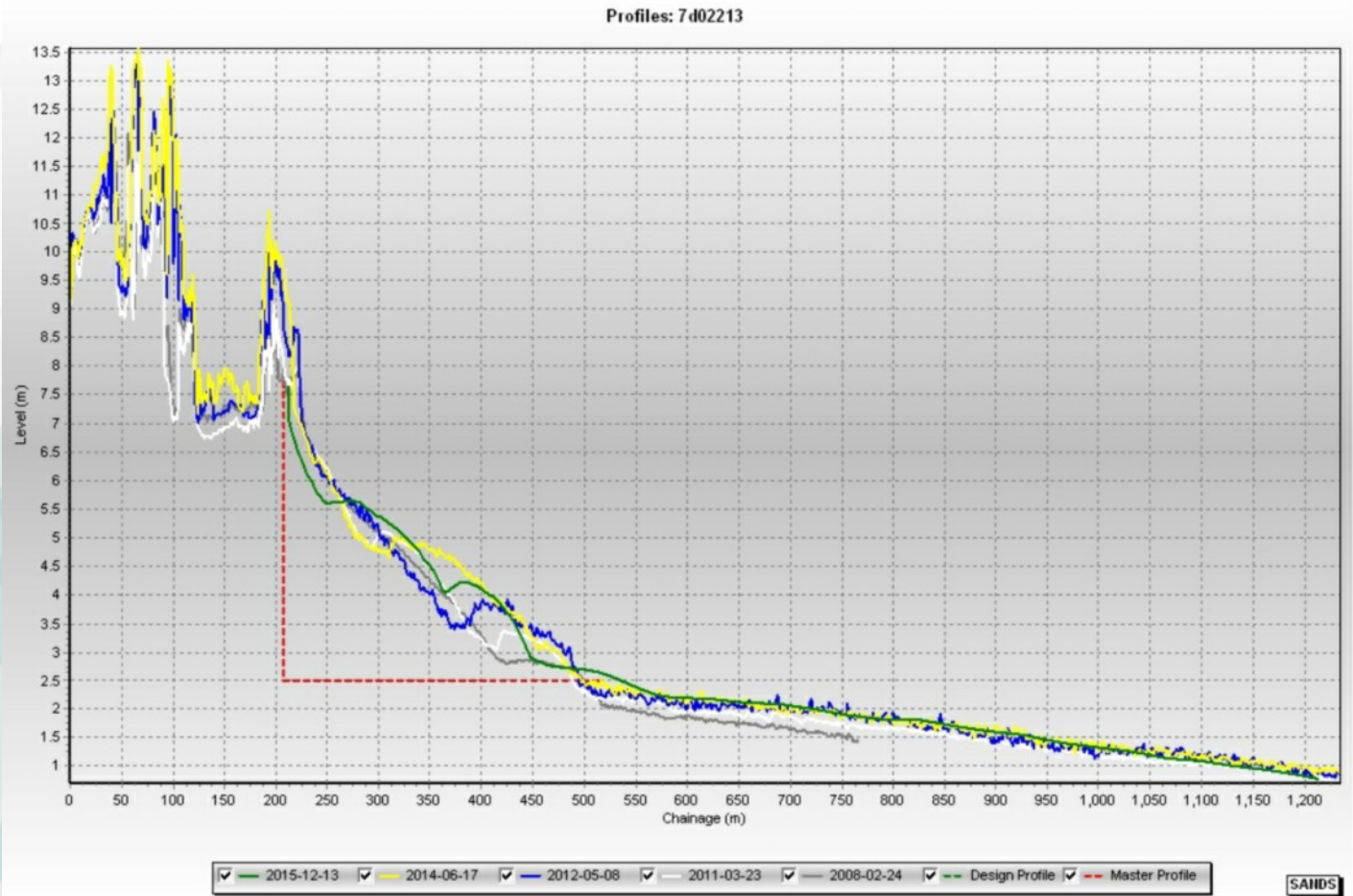
could use these posts to tell whether the dunes along this stretch of beach are eroding or accreting?

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



To see live tide and wave data visit the website  
[www.coastalmonitoring.org/data\\_management/real\\_time\\_data/charts/](http://www.coastalmonitoring.org/data_management/real_time_data/charts/)





**9 A:** The graph above shows beach profiles, number 7d002213, from the years 2008, 2011, 2012, 2014 and 2015 produced from LiDAR measurements at Berrow Dunes. The image on the right shows the same profile captured by aerial photography showing the position of the dunes in the years 2008, 2010 and 2013. From the aerial image, can you say what has happened to the dunes at this point?

**B:** Look at graph above, on the x-axis where the chainage reads 350m. How much did the level of the beach rise or fall here between 2012 and 2014?

