Studland Bay

Enquiry 7: How are coastal processes affecting Studland Bay?

Context and Learning Aims

Pupils will be supported in and outside of the classroom to:

• Identify; describe and explain the physical processes of erosion; transportation and deposition which are occurring along the coastline of Studland Bay;

• Recognise and understand the reasons for the patterns of erosion and deposition along and within Studland Bay;

• Understand that the coastline is in a constant state of change; and that what we assume as being permanent today may well have been very different in the past and could change again in the future;

• Appreciate the range of key stakeholders who are impacted upon by changes that occur to the coastline at Studland Bay;

• Understand why Studland Bay has been an attractive location for visitors and tourists for hundreds of years.
Learning and teaching activities and curriculum progression

Key Question 7.1: What is happening to the peninsula in the north of Studland Bay?

Show the pupils the three images in Resource 7.1. What or who are they and what do they have in common? Encourage discussion, particularly about the painting which will take longer for the pupils to identify. What does it show? Who might it be? The images show tobacco, potatoes and the execution of Mary Queen of Scots. They all have in common the date of 1586. In that year Sir Walter Raleigh returned to the court of Queen Elizabeth 1 with tobacco from Virginia in what is now the United States; Sir Thomas Harriott introduced potatoes to England from Colombia in South America and Mary Queen of Scots went on trial and was sentenced to death for conspiracy against the crown (actually executed on February 8th 1587).

All of this was happening in the same year that Treswell drew the oldest surviving map of Studland Bay and the entrance to Poole Harbour – Resource 7.2. Encourage the pupils to look carefully at the map of the peninsula in the north of the bay. What evidence is there to suggest that Poole Harbour was an important port in 1586? What does the map tell us about the size of the village of Studland then? What evidence is there to suggest how the countryside was used?

The next stage is for pupils to compare the map in Resource 7.2 with the Ordnance Survey map for 1811-1812 in Resource 7.3. Now 235 years have passed since Treswell drew his map. What has changed? Working in pairs the pupils can analyse the two maps and can be supported to identify: What has built up in the north since 1576? What is the Little Sea? Over time huge deposits of sand have built up along the northern peninsula (this is called accretion) creating sand dunes. Behind the sand dunes an area of sea water (Little Sea) is being trapped. There is only one small channel connecting it to the sea remaining. In addition: What has happened to North Haven spit and the entrance of Poole Harbour compared with 1576? Much narrower now as North Haven spit has extended south.

Finally the pupils can now study the modern day Ordnance Survey map extract in Resource 4 and compare this with both the 1811-12 OS map and the Treswell map of 1576. What is the Studland peninsula like today compared with 1576? The Little Sea is now entirely enclosed behind a beach and sand dunes. It is now fresh rather than salt water. The peninsula has become wider to the north; so much so that a road has been built out to the ferry at South Haven Point. Studland village has grown much larger. The photographs of Shell Bay taken form SZ643861 looking NW in Resource 7.5 and of the Studland peninsula looking NW from SZ035836 in Resource 7.6 show what the north of Studland Bay looks like today – wide beaches followed by sand dunes with heath land and woodland behind. Further images of the peninsula and the northern half of Studland Bay (between 035836 northwards to South Haven Point at SZ036867) can be found in Resource 7.7. Today, on average the peninsula in the north of Studland Bay is growing wider and higher through the build-up of sand and rock particles (accretion) by between 0.4 and 0.8m a year.
Key Question 7.2: What is happening to the cliffs and beaches in the southern half of Studland Bay?

Direct the pupils back to the OS map extract in Resource 7.4. The southern part of Studland Bay runs from Handfast Point at SX056826 to just north of Knoll Beach at 035836. Divide the pupils into pairs and give each pair the set of images in Resource 7.8 of the 2km stretch of coastline between Handfast Point and The Warren Wood in the far south of Studland Bay. Using the map and the photographs together describe what this section of the southern coastline is like and what appears to be happening here. Take feedback and promote discussion and key vocabulary. What rock makes up the cliffs? How is the land on top of the cliffs mostly being used? What is happening to the cliffs? What features of erosion can we identify? How high are the cliffs?

Show the animation of erosion of the headland and the formation of Old Harry rocks at Handfast Point at: www.bbc.co.uk/learningzone/clips/old-harry-rocks-coastal-processes-and-landforms/3245.html

The objective here is for the pupils to be able to describe and explain the four stages of headland erosion – caves; arches; stacks and stumps. Show the film a second time to emphasise the erosional process.

The pupils can now produce their own labelled flow diagram to show:

- **Stage 1**: Weak areas such as cracks or joints in the chalk rock are eroded by powerful waves to form caves;
- **Stage 2**: Caves are widened and deepened by the waves to form an arch;
- **Stage 3**: The unsupported roof of the arch eventually collapses to leave an isolated stack completely surrounded by the sea;
- **Stage 4**: Stacks are continuously eroded by waves at all sides and eventually become small stumps just above sea level.

Redlend Point at SX038829 is another headland in the south of Studland Bay. It is much smaller than Handfast Point and made of sandstone rather than chalk. The photograph in Resource 7.9 shows Redlend Point with Handfast Point in the background. In which direction was the camera pointing when the photograph was taken? (ENE) Redlend Point is also being eroded by the sea. Working in pairs the pupils can examine the images in Resource 7.10 and try to agree the sequence of erosion that is leading to cliff collapse here – Stage 1; Stage 2 etc. Erosion by the waves at the base of the cliff is creating small caves which undercut the burden of rock above leading to instability. This leads to the cliff layer above firstly crumbling under its own weight and finally collapsing. The fallen rocks are washed away and the process of undercutting begins again. Over hundreds of years the cliff line ‘retreats’ or moves inland leaving behind a platform of rock which used to form its base. This is known as a wave cut platform. The pupils can use the diagram in Resource 7.11 to support their enquiry and then produce a summative table in Resource 7.12. On this diagram some, but not all; key subject vocabulary has been included as a writing framework. Pupils can add labels to the diagrams and write a description and explanation of what is occurring in each box.
The action of the erosive waves is also creating other and quite unusual features of erosion at Redlund point. Resource 7.13 shows a number of images of these features. A shoe and mobile telephone is included deliberately for scale and proportionality. What are they? How do we think they have formed? Cracks and weaknesses in the surface rock of the wave cut platform are worn away by the swirling action of the wash and backwash of waves until over time a hollow is created.

Key Question 7.3: Why are the beaches in the south of the bay disappearing?
In the south of Studland Bay there are three beaches between SX044825 and SX035835.

How long is this piece of coastline?
What evidence on the map suggests that this stretch of coastline is popular with visitors and tourists?
What is the width of the beach in meters at its widest point?
What is its width at the narrowest point?

South Beach is at SX039827 on the map and here erosion is already at 0.2 metres a year. Take a look at the two photographs in Resource 7.14. One of these is taken at low tide and the other at high tide. With continued erosion at a rate of 0.2m a year what is the problem going to be here especially when tides are high and there are storms also? Resource 7.15 shows that in the past work has been undertaken at South Beach to slow down the rate of erosion. What has been done and how is this particular method of coastal defence designed to protect the coast from the power of the waves?

Further to the north is Middle Beach at SX037829 which can be seen in Resource 7.16. Encourage the pupils to look at the two images of Middle Beach in Resource 7.17a. Compare them carefully and identify what has changed on the beach in the time between the two photographs being taken. What remains? Here at Middle Beach erosion of the beach is occurring at a rate of 0.5 metres a year and some work has been done in the past around Redlund Point at Middle Beach to slow down erosion – what two methods are shown in Resource 7.17b? How is each designed to work? Look at the images of what can be found at Middle Beach today in Resource 7.18. With an average yearly erosion rate here of 0.5m what problems are going to arise in the future? Do you think they are likely to be more or less serious than at South Beach? Who is going to suffer most at Middle Beach as the coastline is eroded? Who are the stakeholders with an interest in what happens? Resource 7.19 shows something radical which has already happened at Middle Beach. What do you suppose the owner of the beach huts is doing? Why? Is this something that can continue to be done year after year do you think?

The third stretch of beach called Knoll Beach SX035835 has always been a very popular place for locals and visitors alike. Have a look at the photographs in Resource 7.20. What has changed since 1920? In particular think about the numbers of people and the activities they are doing? During a warm summer Knoll Beach is extremely popular. What are people doing in the modern photograph in Resource 7.21? What range of activities can be seen? How does this compare with the same beach in 1905? What has changed? Why? As with Middle Beach the average rate of beach erosion at Knoll is 0.5m a year. What evidence of this can be seen in Resource 7.22? In Resource 7.23 there a number of things which are going to be affected when there are high tides and strong easterly winds. What are these things and who
are the stakeholders – the people who will be most affected by flooding? As with both South and Middle beaches things have been done in the past to control erosion at Knoll Beach. The method is called ‘soft engineering’ and involves a natural sea defence rather than building sea walls or gabions. Study Resource 7.24. What is being done and how will encouraging the sand dunes to grow help to prevent erosion of the sand by waves?

As a summative piece for this enquiry pupils can print off a copy of the Google Earth satellite image of Studland Bay in Resource 7.25. This should then be stuck into the middle of an A3 plain piece of paper. The Google Earth image should then be annotated from around the outside with the following labels;

Title: Physical processes at Studland Bay Dorset

- Shell Bay
- South Haven Point
- Sandbanks Ferry
- Studland Heath
- Knoll Beach
- Middle Beach
- Redlend Point
- Studland village
- The Foreland or Handfast Point
- Old Harry Rocks

In addition the following labels should appear correctly located:

Accretion of sand through deposition of 0.5m a year at Shell Bay and the northern Peninsula
Erosion of the coast at Knoll Beach by 0.5m a year
Erosion of the coast at Middle and South Beaches by 0.2m a year

An arrow should then be drawn around the coast from the south to north of Studland Bay to indicate the movement of eroded material, with the label: Transport of eroded material from the south to the north of Studland Bay.
Sample Resources from Enquiry 7. The complete set of resources supporting learning in this enquiry are available on the accompanying DVD and online at www.licco.eu

Resource 7.2

[Image of a map with various geographical features and place names such as Brimckha, Hamed, and other locations]

Credit: National Trust

Resource 7.3

[Image of another map with more detailed geographical features and place names]

Credit: ©Crown Copyright and database right 2013 Ordnance Survey license number 100024198
Studland Bay

Credit: David Weatherly