



Nature-Based Solutions for our coasts: Exploring Our Future Coast sites

Secondary Physical Geography

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Specialist knowledge for teachers

What is saltmarsh?

Saltmarshes are coastal wetlands found in intertidal areas of temperate climate zones that are flooded by seawater. They typically form in low-energy environments sheltered from waves, where fine clay and silt sediments are deposited. Saltmarshes occur in deltas, estuaries, and lagoon environments, commonly where there are large deposits of fine marine and freshwater sediment.

Saltmarshes develop from mudflats, which are first stabilised by biofilms and then colonised by pioneer species such as *Spartina*. Once vegetation is established and there is a continuous sediment supply, the elevation of the saltmarsh increases, allowing other, less salt-tolerant plants to establish.

Why are saltmarshes important?

Saltmarshes are the 'Cinderellas of our coastline', perceived as not as 'pretty' as sandy beaches, yet they offer multiple benefits to local communities. They provide habitats for birds, particularly migratory species in UK saltmarshes, support fisheries, store carbon dioxide, aid agricultural activities, filter pollutants, offer recreational opportunities, protect the coastline from storms, and help buffer the impact of sea level rise. In short, they are excellent mitigators of climate change impacts on the coast.

Morecambe Bay is well known for its cyclical saltmarsh accretion and erosion along its fringes (Pringle, 1995), following the dynamic movement of main river channels such as the Kent, Leven and Lune in the bay. These saltmarshes have been, and some still are, used for sheep grazing. Together with mudflats and sandflats, they provide a habitat for a wide range of invertebrates and birds and are designated protected areas.

So how do they work?

The roots of saltmarsh vegetation bind the sediment, preventing or reducing erosion by tidal currents and waves. Vegetation attenuates wave and tidal currents and enables sediment deposition in the wake of the plants. With the accretion of sediment, mudflats become less submerged by tides and therefore less exposed to waves, currents, and erosion, enabling natural vegetation progression.

Why are saltmarshes disappearing?

Saltmarshes have been eroded worldwide, and it is estimated that 85% of saltmarsh has been lost in England since the 19th century (Centre for Ecology and Hydrology). Several factors are responsible for this loss, such as saltmarsh reclamation (examples of which can be found around the Bay) pollution, and coastal squeeze caused by the construction of coastal defences and other infrastructure at their shoreward extent.

What can we do for saltmarshes?

In the UK, awareness of the importance of saltmarshes has grown. In particular, they are recognised as important natural protection against coastal flooding and erosion. This has led to the protection, restoration, or creation of these habitats. The Environment Agency estimates that the area of saltmarsh habitat in England increased by seven per cent between 2009 and 2019. Several important factors will help the restoration of saltmarshes: their previous existence, evidence of new vegetation such as tussocks of pioneering plants, bed elevation so that tidal inundation is limited, sheltered conditions, and plenty of sediment, nutrients, and seeds. ▶



► In recent years, nature-based solutions, defined as “actions or measures inspired by, supported by, or copied from nature” (Institute of Civil Engineers), have been implemented in the maintenance and restoration of saltmarshes. These solutions are adaptive but require monitoring and adjustments to environmental changes. In this way, saltmarshes become garden-like and offer opportunities for local communities to engage with the design and maintenance of these community gardens, thereby building their resilience to coastal change.

Many restoration projects focus on increasing bed level and trapping sediment. There are also different man-made structures that can assist in these processes.

Local materials?

Local materials, such as willows and other trees resistant to water and salinity, have been used for riverbank and coastal protection for centuries. Often, these straight woody sticks, such as those from willow, would be bundled together and tied with a piece of wicker into so-called fascines. For example, there is evidence of these being used against water erosion by the Romans, for protection of the banks of the Yellow River in China, and for protection of fish ponds from waves in France from around 1600. Probably the most developed fascine work in the 18th century was in the Netherlands. Structures such as willow mattresses or Zinkstuck (sink piece) were used not only for protection from erosion but also for reclaiming land from the sea. Various patterns and wood combinations can be found in the Netherlands and other countries. Willow is one material that has been, and still is, used to produce fascines and fascine mattresses. Willows grow quickly and can thrive in wet soils where other agricultural plants cannot. In addition, they can help stabilise riverbanks. Until the 1950s, manual labour was the primary method of mattress production. The need for a significant increase in structures for post-flood reconstruction led to the mechanisation of production. However, these are still used in the Netherlands today, particularly in protected areas where only natural materials are allowed.

Old crafts

We will use the definition of craft as “an activity that involves making something in a skilful way by hand”. Many products are produced industrially these days, but there is recognition that some old and new crafts remain important for maintaining historic buildings and structures, as well as for producing sustainable and unique products. We will focus on crafts that can be used to produce sediment traps for saltmarsh regeneration, which can develop skills transferable to other activities such as farming and work in national parks. “Britain was once a craft land” (Fox, 2025, p. 4), and thus contributed to societal and economic development. Weaving willow baskets or hazel cockle baskets was considered an important activity. Few craftsmen and craftswomen remain to pass their skills on to the next generation; therefore, it is highly important to learn these skills for the sustainable management of coastal environments.

Curriculum aims and objectives

National curriculum links:

- Understanding coastal processes (erosion, deposition, sediment transport) and how physical and human processes interact to shape landscapes.
- Analysing maps, aerial images and data; interpreting evidence; communicating geographical ideas effectively.

Year 9 students will develop critical thinking, problem-solving and decision-making skills by tackling a real-world environmental challenge. They will deepen their understanding of sustainability and strengthen their ability to apply geographical knowledge beyond the classroom.

Head

Every student has the right to knowledge of sustainability and climate science education. This series of four lessons embed an understanding of the dynamic coastal systems which we live alongside, within a focus on the salt marshes of the bay. Students will gain knowledge around the geographical location and importance the bay and its unique ecosystems, with lessons designed to ignite curiosity in their local environment. Students will learn about the bay as a dynamic system, which changes with seasonal and hydrological systems.

Heart

Embedded within these lessons will be the importance of the value of the bay, utilising students' emotional connection to the landscape to help develop empathy towards the threatened habitats and nature in the bay. The lessons also aim to calm any eco-anxiety that students may be experiencing, showing that because they care about the place in which they live, they too can make a difference.

Hands

Utilising their knowledge and emotional connection which they have developed over the course of these lessons, students will then be introduced to the concept of nature-based solutions. This is where a project design phase is undertaken, where students will be encouraged to creatively find sustainable solutions to the threats faced by salt marshes. Students will have creative freedom to think of what materials are available and would be suitable and what structures they can develop. Following this phase will be a fieldwork opportunity, where students can go into the field to implement and test their structures, putting their knowledge into practice through real life application.

Examples in practice

Can we save our salt marsh?		
	Key question	Suggested activities
Lesson 1	What makes Morecambe Bay unique?	Complete a written description of the location of Morecambe Bay. Using printed maps of the bay, annotate the important social, economic and environmental features of the bay. Class discussion to bring together and complete a written piece of work on why the bay is special.
Lesson 2	What is salt marsh?	Recap: name three features of the bay. Introduction to salt marsh, watch video. Complete a written description of where salt marshes are located around England, highlight the number of marshes found in the Bay Area. Complete a cloze paragraph which details what salt marshes are. Create a 4-part story board which details how salt marshes are formed.
Lesson 3	What threats does the salt marsh face?	Recap: Read the paragraph highlighting some of the key reasons why salt marsh is important in Morecambe Bay. Identify the social, economic and environmental reasons. This can be presented in various ways – mind maps, highlighted text etc. Class discussion focused on what might threaten salt marshes, annotate the photograph together. Using the information provided, complete the table detailing the threats to our local salt marsh. Class discussion around the impacts of the loss of the salt marsh. Potential home learning task – create a poster/petition highlighting the threats to our salt marsh and why we should protect it.
Lesson 4	How can we protect our salt marsh?	Recap: Why does the salt marsh need protecting recap – mind map together on the board with class discussion. Students could also replicate in books. Watch video on example of salt marsh restoration efforts in Essex. Students to think about what is being done and why, and how this could be replicated in our local area. Introduction to nature-based solutions, what they are and how they work. Linking this into students' projects – how they are going to design a nature-based solution to help restore our local salt marshes. Give examples of designs and discuss possible materials.
Lesson 5	Project design	Students will bring materials from home, and provided with some support materials to help them design and create a nature-based solution to restore local salt marsh.
Lesson 6	Field work/workshop	Going and studying the salt marsh which currently is in situ. Studying biodiversity and potential for coastal protection. Possibility to implement and test some of their solutions for salt marsh regeneration? Revisit at a later date to test success rates? Alternative activities could include conducting field work in the salt marsh before any solutions are created as well.



1. Photograph of the Bay



2. Picture of a saltmarsh



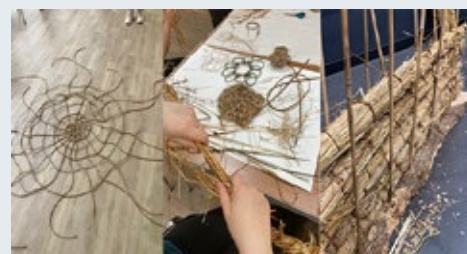
3. Saltmarsh erosion



4. Saltmarsh and BESE



5. Hest Bank saltmarsh – fieldwork



6. Materials from Coastal Lab

Adaptations to extend impact

Dallam School is a rural school with a large catchment area, stretching from Kendal – Grange-Over-Sands – Lancaster. As such, we have students from a vast range of backgrounds, including a considerable number from the farming community.

It can be particularly hard to engage this group of students as they progress through school, as they already know the career path they are going to take upon leaving school. Therefore, this project aims to help engage students but also deliver practical hands-on experience which can be replicated in a number of scenarios they might come across in the future, whilst also encouraging them to do this in a sustainable manner.

In some schools, it may be possible to scale up the project to be a whole school activity, where cross-curricular learning focuses on our local area from various viewpoints. It might be that some schools choose not to take part in the field work or have a site more suitable for them where they can visit. In other schools, there may be opportunity to go out in the field more than once. For example, there could be a site visit prior to development of nature-based solutions.

Primary schools (KS1 and KS2) may want to embark on this as a creative endeavour, where students access our local salt marsh through storytelling and art.

