# The Key to Keyhaven

## STUDENT INTRODUCTION

The picture above shows Keyhaven Saltmarshes, which are part of the more extensive salt marsh system which extends along the coast to the east of Lymington.

In this resource you are going to learn all about what slat marshes are and how they develop. On your ferry crossing, from Lymington to Yarmouth (or vice versa), you will be able to see the salt marshes for yourself. You will also be learning about their importance, threats to salt marsh ecosystems and what can be done to manage them.

What you learn may form part of a case study for your exam, so please make sure you pay attention.



**PRE-VISIT TASKS**

## Introducing Salt Marshes

Read the following information very carefully – you will then complete a series of tasks based on what you have read and learnt!

Salt marshes are found in coastal environments where sheltered water allows sediment to be deposited and build up over time to create a unique ecosystem. Sheltered water is found behind a spit, and this can provide the perfect conditions for deposition of sediment. Similarly, estuaries, where rivers enter the sea, are areas where large accumulations of sediment which have been carried down by the river can be deposited. Where they develop at river mouths, the water will be **brackish** – partly salty and partly fresh water).

Sediment is deposited and initially builds up to form **mud flats**. These are exactly what the name suggests – flat areas of mud! They are what is known as **intertidal**, in that they are covered at high tide and exposed at low tide. The picture shows mudflats exposed at low tide in Lymington.

PRE-VISIT TASKS

## Introducing Salt Marshes (continued)

Mud flats may appear to be lacking in life, but actually make an attractive home to all sorts of invertebrates and shellfish, such as spire shells and mud shrimps, and tiny microscopic plankton. The mud itself also contains many nutrients. All of this supports a rich variety of wading birds and wildfowl, which take advantage of the rich 'larder' on offer at low tide.

Once the mud flats are well established and are exposed at low tide, a few hardy species of plants, that are able to tolerate the hostile environment, ***colonise*** the site. These are known as **pioneer species,** and they are specially adapted to the highly saline and harsh conditions found in the inter-tidal zone. One example is eel grass which can survive regular submersion by salt water, but at the same time can cope with the drying effect of strong winds at low tide. Over time, these pioneer plants help to trap more sediments, and they build up the level of the mudflats. After this, other species are able to grow in the changed, improved, conditions, such as thrift and sea lavender; this is known as **plant succession**. Ecological succession is where the structure of an ecosystem changes and evolves over time, going through a series of stages where the 'mix' of species alters according to the changing conditions. In a salt marsh, the succession that takes place is known as a **halosere.**

As you move inland in a salt marsh, you will see that the characteristics of the ecosystem change, both in terms of the abiotic (non-living, e.g. soil, PH, salinity) and biotic (living, e.g. plants and animals) features. Further inland there has been more time for change, and the upper marshes may eventually become so developed that a **climax community** of ash / alder woodland may be seen. This older, and far more developed, part of the marsh is usually above the level of all but the highest spring tides and/or storms. The high marsh may contain **pannes** (shallow depressions) and **pools** (deeper depressions) of water.

Throughout the salt marsh, a series of creeks drain the marsh at low tide. The photo shows a creek in the marshes at Lymington, at low tide. The creek's slow tidal energy, and the marsh vegetation diminishes the energy of the waves. Therefore, constant deposition occurs and, over time, this means that the salt marsh continually extends seawards.

Well-developed saltmarshes can, in fact, be an excellent natural buffer against erosion, protecting valuable property and human 'assets' against wave attack.



TASK 1

### The 'Location, location, location' of Lymington...

Study the OS map on page 3, and find the salt marshes that extend along the coast between Hurst Spit and to the east of Lymington.

- Based on what you have learned about where salt marshes develop, and why they develop in these locations, **label the map** to describe the location of the salt marshes here.




## Extension

Put together the annotations that you have written to answer the following exam-style question:

**'Describe and explain the factors affecting the location of coastal salt marsh ecosystems'**

TASK 2

## Picking apart the parts

Your teacher will show you a diagram to show what the zones of a typical salt marsh ecosystem look like, and the characteristics of each zone.

Study the diagram closely, and listen carefully while your teacher explains it to you.

Then, look at the image below which shows a picture of a section of the salt marshes at Lymington, (taken at mid tide level).

- Label the different parts of the salt marsh and then add other labels to indicate what the main features of each part are. Use the words/ sentences in the textbox.



| | | | | |
|---|---|---|---|---|
| Upper part of tidal mudflat just visible | | Lower marsh | | |
| Higher marsh | Upper border | Above tidal reach | Creek | Panne |
| Pool | Pioneer species | Older marsh | Newer marsh | |

TASK 3

## Highs and lows

The pictures below were taken facing the same direction. One was taken at high tide, and the other at low tide. Annotate the images to highlight some of the differences between them.

Try to think of things like the extent of flooding at high water/exposure at low water, and both the pros and cons of flooding and exposure to the plants and animals that live there. For example, at low tide when the mudflats are exposed, this poses a threat of drying out to some species.

TASK 4

## Species spotters!

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You are going to learn a little bit about the species of both plants and birds that live and/or breed/feed in a salt marsh ecosystem.

- Look at the following images on page 6 and 7, all taken in the Keyhaven-Lymington marshes. Either using a key, or website(s), you will find out what these species are, and label using the right name in the textbox, and write a sentence or two about each one.

| | | | | |
|---|---|---|---|---|
| Black-headed gull | Mute swan | Cordgrass | Little Egret | |
| Sea Lavender | Oystercatcher | Wigeon | Sandpipers | Samphire |

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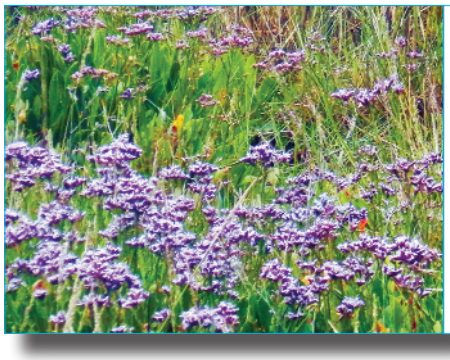

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## The significance of salt marshes

So, you already know about some of the different types of flora and fauna that inhabit a salt marsh ecosystem. Salt marshes are an important coastal ecosystem and you are going to learn why!

You are also going to learn more about the Keyhaven-Lymington salt marsh specifically, and what its significance, on a local and national scale and even on an international scale, is.

Below you will find quite a few suggested weblinks, where you will find a lot of information about the marshes and their importance. Use the information that you gather as you research to complete the table on page 8 and 9.


**http://www.hiwwt.org.uk/reserves/lymington-and-keyhaven-marshes**

**https://www.hants.gov.uk/thingstodo/countryside/finder/lymingtonkeyhaven**

**https://www.lymington.com/1029-lymington-to-keyhaven-nature-reserve**

**http://www.hants.gov.uk/rh/lym/leaflet.pdf**

**https://en.wikipedia.org/wiki/Keyhaven,_Pennington,_Oxey_and_Normandy_Marshes**

**http://www.rspb.org.uk/groups/newforest/places/163879/**

**http://www.sssi.naturalengland.org.uk/citation/citation_photo/1001019.pdf**

**http://www.newforestdc.gov.uk/CHttpHandler.ashx?id=23565&p=0**

| | |
|---|---|
| Describe the location, and extent, of the marshes | |
| What species of plants can be found here? | |

| | |
|---|---|
| What species of birds can be found here? | |
| What other species of fauna (e.g. insects, fish, invertebrates) can be found here? | |
| Describe the importance of the marshes for humans; both past and present | |

## ON-SITE TASKS

You are now going to travel on Wightlink ferries across the Solent to/from the Isle of Wight. You will see Hurst Spit, and the salt marshes behind it, and extending across the Lymington River estuary, from the ferry. You should complete the following activities, to the best of your ability, during the crossing.

### Task 1: Shoreline sketch

You should aim to make a simple sketch of the shoreline between Hurst Spit as far as just to the east of Lymington, where the ferry comes up the river and docks. Include the outline of the coast, the spit, and the salt marshes. Once complete, label it to indicate the main features.

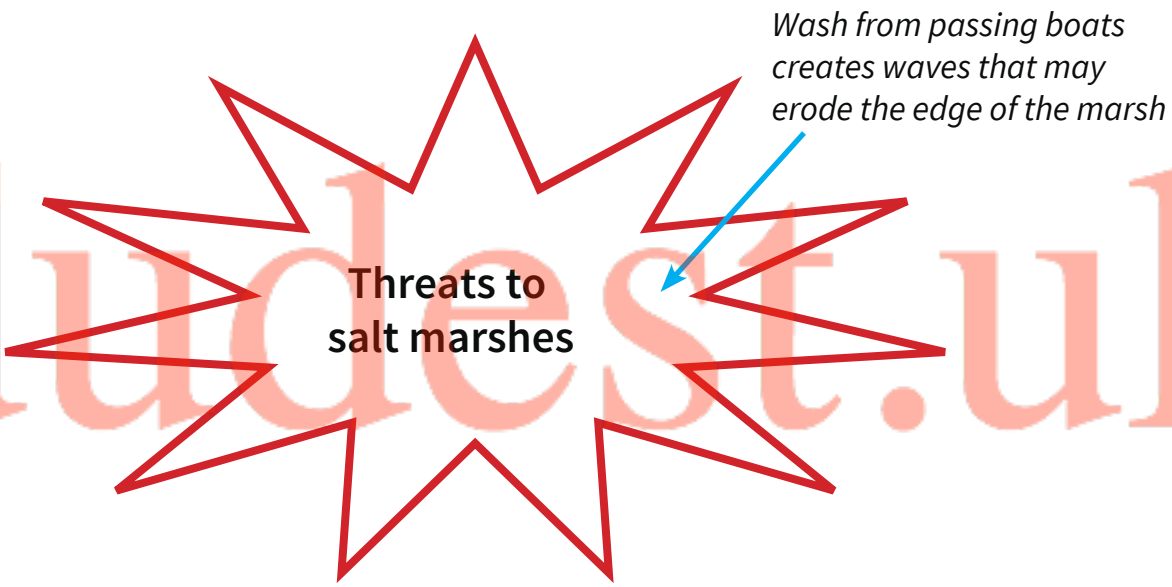
TASK 2

## Threat detectors

When you were researching for task 5 in the pre-visit section, you probably read a little bit about the threats to salt marshes or even these salt marshes here in particular?

Can you think of, or remember, any? There's a clue in the photo, and the first one has been done for you!

▶ Write some of your own ideas around the diagram below.






Try to add some specific detail as you travel, e.g. if you spot a specific example of something that you think poses a threat to the salt marshes here. You could also take a photo of any threats that you observe!

## Threat effects

What are some of the effects of the threats that you have identified?

TASK 3

**Salt marsh die-off** is a term that has been coined in the US and the UK to describe the death of, and subsequent degradation of, salt marsh ecosystems.

The salt marshes in the Lymington/Keyhaven area have been steadily dying back and declining due to a gradual loss of the spartina (cordgrass) vegetation that binds and stabilises the mudflats and forms the basis of the salt marsh plant community. When this vegetation dies off, the salt marsh is exposed to wave erosion and the banks can become unstable, collapse, and retreat.

Creeks through the saltmarsh widen and enlarge. Sea level rise in recent decades has also played its part in increasing the effects of erosion from the sea, and the increased frequency and severity of winter storms (many believe to be attributed to global warming too) have increased wave erosion. The seaward edge of the marshes at Lymington and Keyhaven have been eroding at a rate of about 3 metres each year, or even up to 4 metres in very exposed sites.

Can you see any effects of salt marsh die-off from the ferry? Look at the images below, and see if you can spot evidence of this for yourself and try to take some photos if you can. Then, using the information above, annotate the images to describe and explain the effects of human activities, either direct or indirect, on salt marsh ecosystems.

TASK 4

## What can be done?

From the ferry, see if you can spot the following strategies that have been put in place in and around the Lymington River estuary, to try and manage and conserve the salt marsh ecosystems here. For each one, try to suggest HOW and WHY it will help to protect the salt marshes – the first has been started for you. You will be examining this further in the post-visit task.

Breakwater, eastern side of harbour entrance

Sea wall around edge of western edge of harbour/ town, extending towards Keyhaven



Breakwater, western side of harbour entrance

Wooden wave screens at entrance to inner harbour


**4 knot speed limit in inner harbour**


**Speed limit reminders on navigation markers. 6 knot limit in outer harbour**

**Navigation markers to guide vessels**

| Management Strategy | How/why does this help to protect the salt marshes? |
|---|---|
| Wooden wave screens | Built across the entrance to the inner harbour, these act as a barrier to incoming waves/wash from boats and 'break' their power. This helps to protect the salt marsh because… |
| Breakwaters | |
| Sea wall | |
| Navigation markers and controls | |
| Speed limits | |

## POST-VISIT TASKS

You have learnt all sorts of things about salt marsh ecosystems, the potential threats to them and also a little about what can be done to mitigate and manage these impacts. You have seen the Lymington section of the Lymington to Keyhaven salt marshes first-hand.

## Task 1: Adding depth

The document that can be viewed at the following website provides a lot of additional information about the Lymington-Keyhaven area. Use it to go back over the activities that you have completed so far in the worksheet and add additional notes/information. Your teacher will help you to do this

http://www.newforestdc.gov.uk/CHttpHandler.ashx?id=23565&p=0

## Task 2: Group research and presentations

In this activity, you are going to learn a little more about the management in place here, and how this, combined with conservation designations, is helping to manage the fragile and important salt marsh ecosystem.

Your teacher will divide you into groups. Each group will be given one of the following aspects to research. You are provided with some web-links to help you with your research. Use these to investigate your given topic thoroughly. Then, using this research, you will produce:

1. A presentation for your class
2. An A4 information page for each person in your class to provide them with a summary of your topic



### Group 1: Shoreline planning

You are going to be researching and investigating the SMP – Shoreline Management Plan – in place along this stretch of coast.

Weblinks:

- http://www.newforest.gov.uk/CHttpHandler.ashx?id=8201&p=0
- http://www.northsolentsmp.co.uk/media/adobe/g/j/18-_Sowley_to_Hurst_Spit.pdf

Information on each 'policy unit' in the SMP can be found at:

- http://www.northsolentsmp.co.uk/CHttpHandler.ashx?id=12986&p=0 (unit 5C20)
- http://www.northsolentsmp.co.uk/CHttpHandler.ashx?id=12987&p=0 (unit 5C21)
- http://www.northsolentsmp.co.uk/CHttpHandler.ashx?id=12988&p=0 (unit 5C22)
- http://www.northsolentsmp.co.uk/CHttpHandler.ashx?id=12989&p=0 (unit 5F01 – Hurst Spit)

## Group 2: Habitat replenishment

You are going to be researching and investigating the work that has being, and is being, undertaken to replenish and conserve the salt marshes

Weblinks:

- https://www.thecrownestate.co.uk/media/5495/lymington-harbour-phase-2-habitat-replenishment-scheme.pdf
- http://www.lymingtonharbour.co.uk/notices-template.aspx?page=S635822271655637879&ArchiveID=10&CategoryID=5&ItemID=224&src
- https://www.youtube.com/watch?v=_AIgYACJfSQ

## Group 3: Harbour management

You are going to be researching and investigating the work that has being, and is being, undertaken within the harbour/harbour entrance

Weblinks:

- http://www.lymingtonharbour.co.uk/harbour-protection
- http://www.lymingtonharbour.co.uk/wildlife-and-conservation



## Group 4: Climate Change

You are going to be researching and investigating the predictions relating to climate change, how these are likely to affect the salt marshes and the area in general, and how this can be managed.

Weblinks:

- http://www.newforest.gov.uk/article/7182/Saltmarsh-Erosion

Type the following into Google to find a good article on salt marshes and climate change:

- publications.naturalengland.org.uk/file/5105151815712768

The following weblink looks at the East Coast but has some good information applicable to all coastal ecosystems: http://www.rspb.org.uk/images/crisis72_tcm9-133013.pdf

## Group 5: Other conservation designations

You are going to be researching and investigating the other designations that the area has been given, what these are and how they help to conserve the environment here.

Weblinks:

- http://www.lymingtonharbour.co.uk/wildlife-and-conservation

Below is a link to an online GIS mapping tool, called 'Magic', managed by Natural England. Find Lymington and explore the different layers in the 'table of contents' to find out about it

- http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx

Find out more about what each conservation designation is, and what it does exactly to protect the environment, by conducting your own additional research.

## Group 6: Wightlink marsh works

You are going to be researching and investigating what Wightlink has been doing to help to conserve the environment here.

Weblinks:

- http://www.lymingtonharbour.co.uk/harbour-protection (see 'options to reduce marsh erosion rates)
- http://www.wightlink.co.uk/wp-content/uploads/R2557_Summary_Final_for-_EMP_02Dec15.pdf
- http://www.omreg.net/sediment-recharge-example/
- http://www.bbc.co.uk/news/mobile/uk-england-hampshire-15938640
- http://www.solentprotection.org/wp-content/uploads/Colin-Scott-SPS-Habitat-Creation-20Feb14.pdf (some good images 3/4 of the way into the presentation!)

You will find more articles and YouTube clips by conducting your own additional research.