



# THE LITTLE BOOK OF OF BIG TIDES

A little book of small sea creatures and big ocean wonders



Supported using public funding by  
**ARTS COUNCIL  
ENGLAND**

# A CITY THAT MOVES WITH THE TIDE

Plymouth is a city shaped by the sea. The rivers Tamar and Plym flow into Plymouth Sound, where river water and seawater meet.

Every day, the tide changes the edges of the city. As the water rises and falls, beaches grow and shrink, rocks appear and disappear, mudflats are uncovered and boats rise and fall in the harbour.

A place can look very different at high tide and low tide - even though the place has not moved at all.

## TIDE TOGETHER CHALLENGE

Think of a place in Plymouth where you have seen the sea, a river or a harbour. What might change there as the tide goes in and out? Write down three places you know that are affected by the tide.

1

.....

2

.....

3

.....

## DID YOU SEA THAT?

Plymouth has rocky shores, beaches, estuaries, mudflats, creeks and saltmarshes. Each habitat responds differently as the tide changes.

# WHAT IS A TIDE?

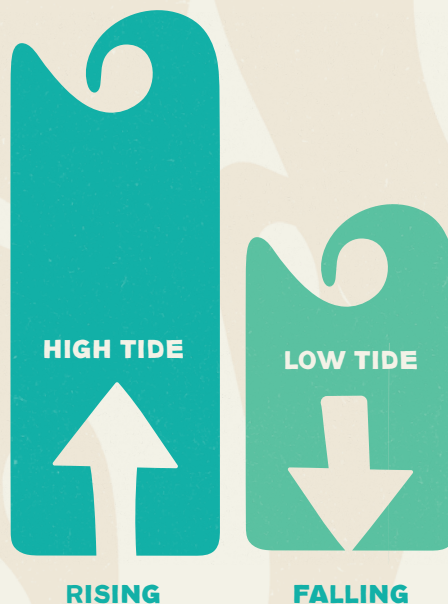
## GO WITH THE FLOW

**A tide is the regular rise and fall of the sea.**

At high tide, the sea reaches farther up the shore and covers more of the land. At low tide, the water moves farther away and more of the shore is uncovered.

A tide that is coming in is called a rising or incoming tide.  
A tide that is going out is called a falling or outgoing tide.

The difference between the height of high tide and low tide is called the tidal range.



## WHAT HAPPENS NEXT?

Number these stages of the tides from 1 to 4.  
Why not draw a little icon to represent each stage?

The tide begins to fall.

The sea reaches high tide.

Rocks, sand or mud are uncovered.

The tide turns and begins to rise again.

**TIME AND  
TIDE WAIT FOR  
NO ONE!**

The sea may look far away at low tide, but it can return surprisingly quickly.

## DID YOU KNOW THAT?

Around Plymouth, there are usually two high tides and two low tides in a little over 24 hours. Tide times change each day, so people using the coast need to check them carefully.

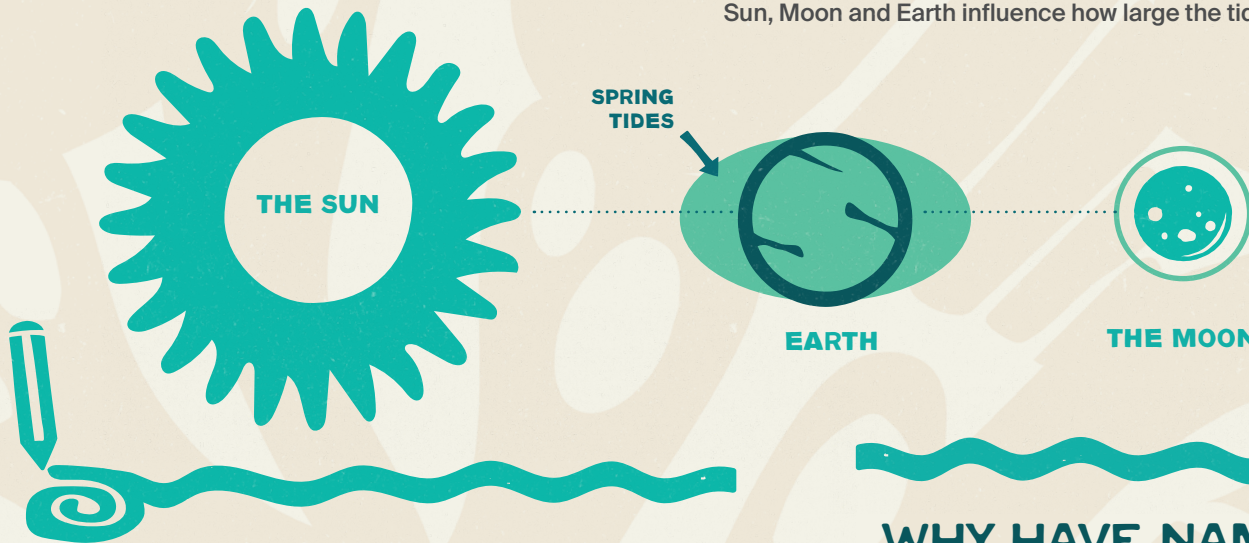
# WHAT CAUSES THE TIDES?

## The Moon is pulling the strings

The Moon's gravity pulls on Earth's oceans. This helps create high and low tides. Gravity is an invisible force that pulls things towards each other.

As Earth rotates, different places move through areas of high and low water.

The Sun's gravity also affects the oceans. The positions of the Sun, Moon and Earth influence how large the tidal range will be.



## WOULD YOU SURVIVE?

Imagine you were an animal living in the intertidal zone. Every day, the sea would cover you and then disappear, leaving you exposed to the air. Which challenge would be hardest to cope with?



Strong waves and currents



Heat from the sun



Drying out when the tide goes out



Cold temperatures

Hungry predators

Why? .....

## WHY HAVE NAMES FOR TIDES?

### Spring tides

When the Sun, Moon and Earth are roughly in line, their pulls combine. High tides are higher and low tides are lower than usual.

### Neap tides

When the Sun and Moon are roughly at right angles to Earth, their pulls do not combine as strongly, so the difference between high and low tide is smaller.

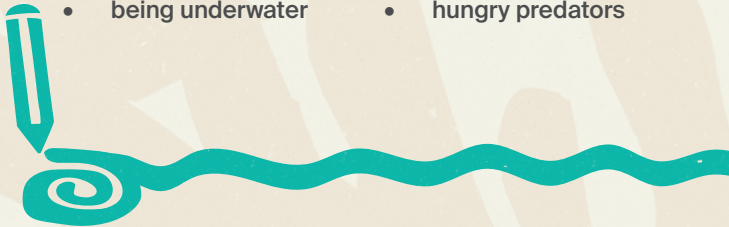
# THE INTERTIDAL ZONE

## CAUGHT BETWEEN TWO WORLDS

The intertidal zone is the part of the shore that is covered by the sea at high tide and uncovered at low tide.

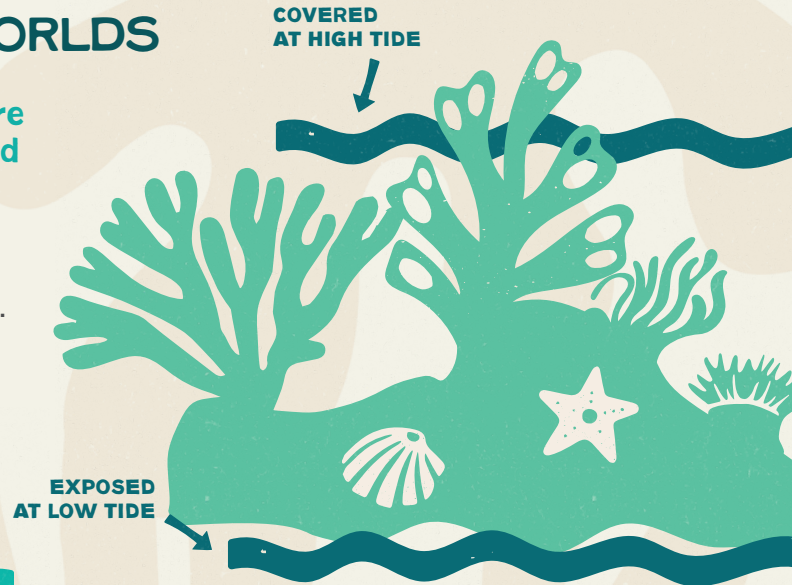
At high tide, it is covered by seawater. At low tide, it is exposed to the air. This means that the animals and plants living there must survive in two very different environments.

- strong waves
- hot sun and cold air
- being underwater
- drying out
- changes in saltiness
- hungry predators



### IMAGINE THAT?

Imagine that your home was underwater for part of every day and exposed to the wind and sun for the rest. What would you need to survive? Draw all the things you think you would need.



### SHORE THING

The shore can be divided into three broad areas:

**UPPER SHORE:** underwater for the shortest time.

**MIDDLE SHORE:** regularly covered and uncovered.

**LOWER SHORE:** underwater for most of the time.



# WHO LIVES THERE?

Meet Plymouth's tide-side survivors, the amazing creatures that live in the Intertidal Zone. Which one do you think has the best survival strategy?



## LIMPET

A limpet uses its powerful foot to cling tightly to rocks. Its shell helps protect it from waves and stops it drying out.



## BEADLET ANEMONE

Underwater, its tentacles catch food. When the tide goes out, it pulls them inside and looks like a shiny red or green blob.



## SHORE CRAB

Shore crabs shelter beneath rocks and seaweed. They can move between pools as the tide changes.



## PERIWINKLE

A periwinkle can close a small trapdoor over the opening of its shell, helping to keep moisture inside.



## MUDFLAT WORMS AND SHELLFISH

Worms, cockles and other small animals live hidden in the mud. When the tide falls, they provide food for wading birds.



## TIDE TOGETHER CHALLENGE

Design your own intertidal creature. Give it three adaptations that would help it survive between land and sea.



# WHY DO TIDES MATTER?

WE'RE ALL IN THE SAME TIDE

Tides do much more than move water up and down. They shape how people and wildlife use Plymouth's coastline.

## Tides affect:

- when shore animals can feed
- when birds can reach creatures living in the mud
- where fish and other marine animals move
- whether boats can enter shallow areas
- when people can explore beaches and rock pools
- swimming, paddleboarding, fishing and sailing
- coastal safety and flooding



## BECOME A TIDE DETECTIVE

- check the tide times
- record the time and weather
- look for clues showing where the water has been

When visiting the coast with a responsible adult:

- compare wet, dry, shaded and sunny areas
- observe wildlife without taking it home
- think about how the place will change when the tide turns

COMPARE SUNNY, WET, DRY & SHADED AREAS

WHERE HAS THE WATER BEEN?



# TIDE TOGETHER FOR PLYMOUTH'S SHORE

Plymouth's intertidal zone is full of life. We can all help to protect it. See if you can tick all the boxes of our Salty Seashore Code when you next visit the beach.



I gave wildlife space. I watched seabirds and animals from a distance and enjoyed the moment quietly.



I avoided sensitive areas like mudflats and seagrass and moved slowly to protect the wildlife and habitats.



I rockpooled with care. I gently returned rocks and creatures exactly as I found them.



I took my litter home or used a bin and did my bit to help keep the Sound healthy for everyone.

When we learn about Plymouth's shore, care for its wildlife and explore it safely, we are all Tide Together.



## GLOSSARY

### GRAVITY

The Moon's pull

### TIDAL RANGE

The difference between high and low tide

### INTERTIDAL ZONE

The area covered by the sea at high tide and uncovered at low tide

### MUDFLATS

A muddy shore covered at high tide and exposed at low tide, providing food and shelter for wildlife.

### SALTMARSH

Coastal land regularly flooded by seawater, where salt-tolerant plants grow and wildlife thrives.

### ESTUARIES

Where rivers meet the sea

### PREDATORS

Animals that hunt and eat other animals

### ADAPTATIONS

Special features that help an animal survive

