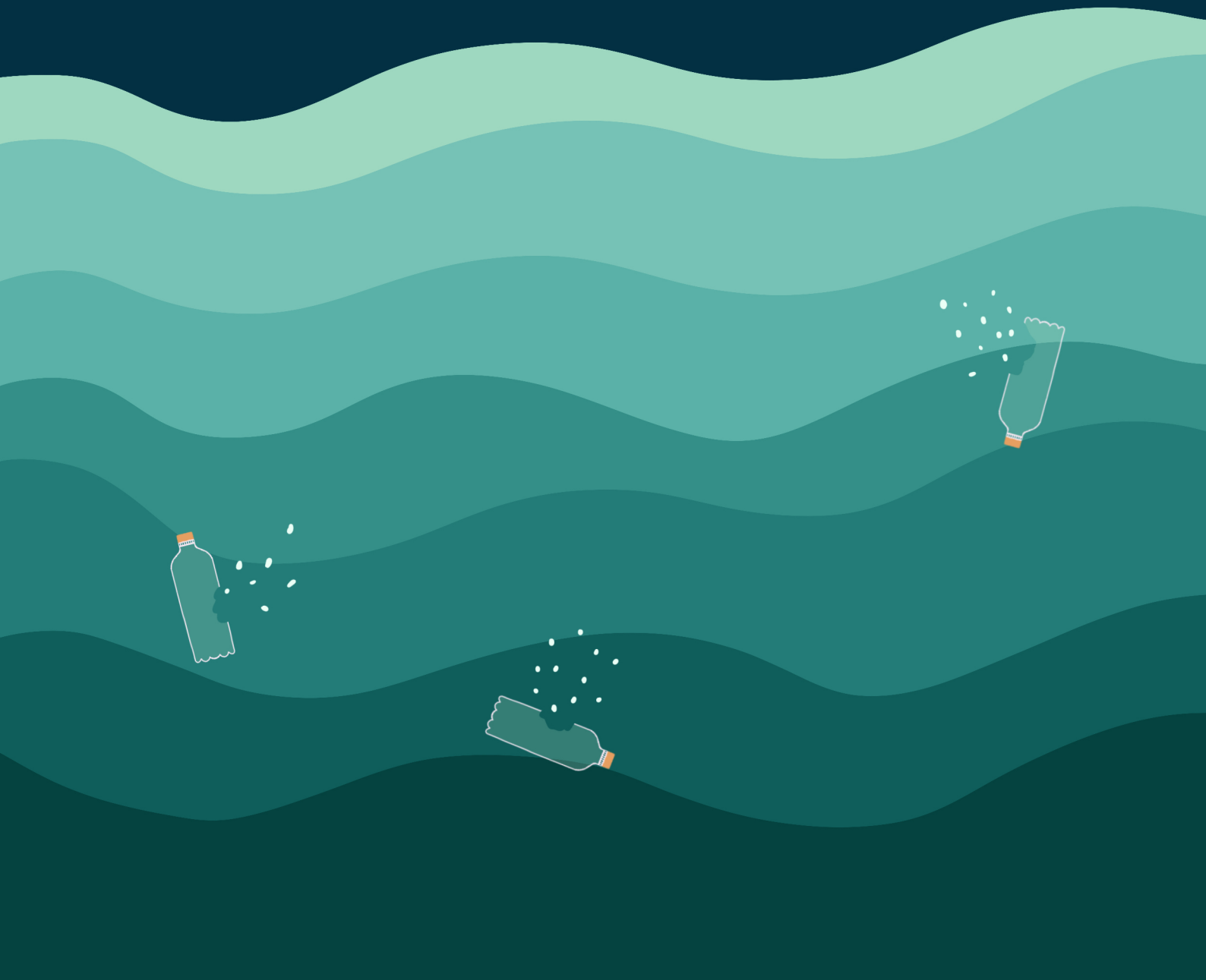
PROJECT SEAGRASS

MICROPLASTICS ACTIVITY GUIDE AGES 11-14



OVERVIEW

This activity guide introduces the topic of Microplastics. Within this guide is an activity and work sheet follow up with answers.

KEY INFORMATION

- Indoor or outdoor activity
- Partner or group activities
- Time – 1/2 hours
- Practical

- **Lesson Objective:** to understand what microplastics are, where they come from and how we can try to reduce them. To see how seagrass naturally filters the water, trapping microplastics.
- **Curriculum links:** Geography/Science/Numeracy

LEARNING TIPS

This 'Microplastics' guide can be used with Project Seagrass activities in the '**Water filtration**' and '**Food chains**' guides to explain better how seagrass traps microplastics in the same way as suspended solids and how plastic accumulates as it works its way up the food chain. Also link to the '**Making changes**' guide where a sustainability audit is conducted.

Try to encourage open discussion about changes to our own lives we could make to reduce plastic pollution, emphasising how the pollution is directly from our homes. Discuss whether plastic is sustainable.

KEY WORDS

Bioaccumulate – The build-up of something (e.g., plastics) in an organism

Finite resource – A resource that will run out (earth only has a limited amount)

Microplastic – Plastic which is smaller than 0.5cm

Microfiber – A manmade (synthetic) fiber that's smaller than human hair

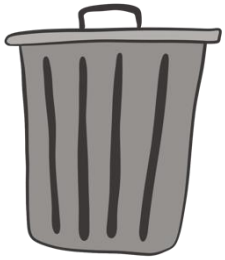
Primary microplastics – Plastics that are originally designed to be tiny!

Secondary microplastics – Fragments broken down from larger plastic items

Salinity - The amount of salt dissolved in a liquid

INTRODUCTION

What are microplastics?



Everything we use or pop in the bin ends up somewhere. Hopefully that's a recycling station, but sadly a lot of our **waste escapes** and ends up in the **sea**. It can get there via **littering**, down our **drains** or swept to sea by **storms**. **Water samples** from the most **remote** and untouched parts of the world show how we have inundated our seas with rubbish, namely **microplastics**.

FUN FACT!

The river Thames going through London has the most microplastic pollution of all rivers in Europe, with an estimated 94,000 microplastics per second flowing down it!

Plastics are made from **finite** sources of **petroleum (oil)** and **gas** in such a way that they can take thousands of years to completely breakdown. As plastics take so long to degrade, we just keep filling the seas with more and more generations of plastic litter.

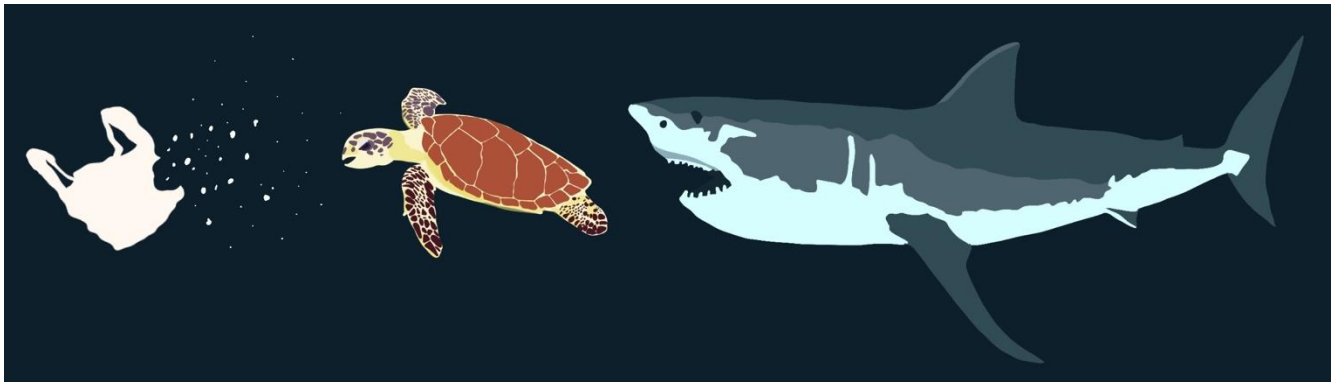
So how about microplastics? These are tiny bits of plastic which are less than **0.5 cm** in size. Check on a ruler just how small that is! We have two main types of microplastics: **primary** and **secondary**. **Primary** microplastics have been **designed** to be so small that they can pass through most water filtration systems, such as the plastics found in **cosmetics** and beauty products. **Secondary** microplastics are the result of larger plastic items slowly **breaking down** into little bits as a result of **weather** and **wave** action.

Another form of microplastics is **microfibers**. These are man-made fibers that are smaller than human hair. Every time we pop a clothes wash on, millions (potentially 17 million!) of tiny plastic microfibers are released into our drains and are small enough to escape out to sea.

What's the problem?

Microplastics are in the **air** we breathe but also have now been found in every corner of our **oceans**, as well as in many different animal's **stomachs**, from whales to crabs, seabirds to humans. The animals may stop eating as their stomachs are filled with plastic. Many also get ill from the harmful **chemicals** and **pollutants** that are attached to the plastic that they have mistakenly eaten.

The amount of plastics and pollutants in the animal increases as we look further up the food chain in a process called **bioaccumulation**. For example, if 5 small fish have each eaten 3 pieces of plastic, and then 1 dolphin eats all 5 fish, the dolphin now has 15 pieces of plastic in its stomach.



Extra microplastic info:

- https://www.nationalgeographic.org/encyclopedia/microplastics/ National Geographic give a quick overview of microplastics.
- https://plantbasednews.org/news/environment/microplastics-what-are-they-how-do-they-end-up-in-our-ocean/ Explains the main sources of microplastic.
- https://friendsoftheearth.uk/plastics/microfibres-plastic-in-our-clothes Friends of the earth looking at microfibers.

Salt water and density explanation:

- https://www.youtube.com/watch?v=vCw1guhZzrQ&ab_channel=Questacon Easy density experiment!

Investigation time!

We're going to look at the microplastics at your local beach (this can be a river beach too!). Scientists have found that seagrass is good at trapping microplastics by locking them away into the seabed and removing them from our seas. Let us see if this is true for your beach!

When we swim in the sea we feel 'floaty' in comparison to being in a swimming pool. This is because the salt in the sea makes the water thicker (like soup) and better at lifting us up. Using this same idea, we can use really salty water to separate out microplastics from sediment as the salty (denser) water helps the microplastics to float.

ACTIVITY:

1) Decide how many sediment samples your class will aim to collect from two different areas. Aim for a minimum of five samples for each!
2) Choose your sample collection point. Try to choose an area with vegetation such as seagrass or a weedy riverbank and an area with a bare bottom, such as sand. Avoid areas where you may harm animals or their homes or that are dangerous to get to.
3) Collect the samples at low tide as far out as possible without getting wet.
4) To collect the sample, use the trowel to scoop sediment from the seabed into the sample collection pots.
5) Carefully label the collection pot (e.g., SG.KS.1 would be seagrass sample by Kate Smith, sample number 1, agree with the whole class your labelling system before heading to the beach!).

YOU WILL NEED:

A sea or river beach

Sample collection pots (100ml minimum)

Trowel

Table salt (lots!)

Clear beaker (100ml)

Magnifying glass or microscope

HEALTH AND SAFETY

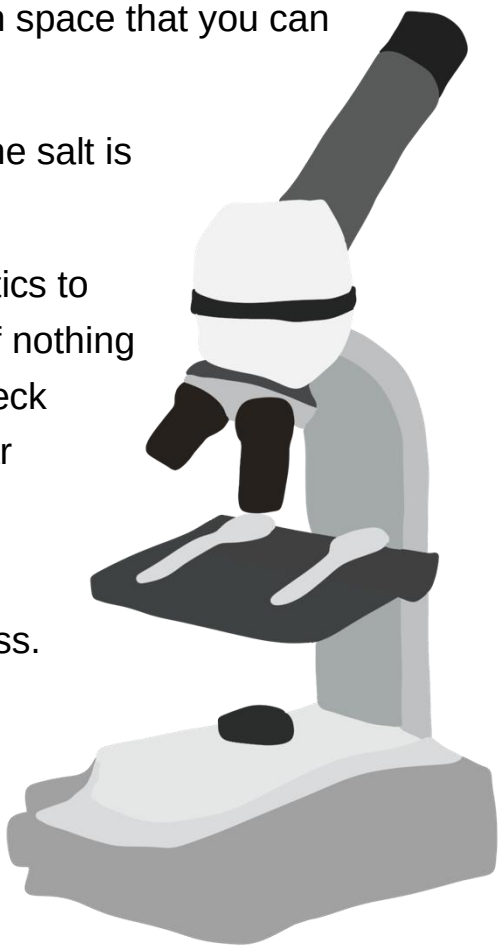
Standard shore health and safety - all work done whilst tide is out, with no one entering the water. See tips for tidal work

Do not consume salt water

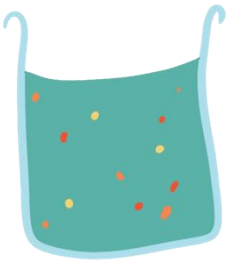
6) Back in the classroom put 50 ml of the sand from one sample into the clear beaker. Fill the beaker with water, leaving enough space that you can easily stir.

7) Add 3 tablespoons of table salt and stir until all the salt is dissolved.

8) The high salinity will cause most of the microplastics to float and be poured into a second glass beaker. If nothing is floating, you might need to add more salt or check under a microscope. Sadly, microplastics are near enough everywhere, so are likely in your sample!



9) Now count the number of microplastics and microfibers using a microscope or magnifying glass. Some maybe big enough to see with the naked eye.



10) Form a class data set of the number of microplastics and microfibers in each sample.

11) Work out the average and range for samples from the seagrass meadow and the bare sand site

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WORK SHEET FOLLOW UP:

1) Which site had the most microplastics and microfibers?

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2) Does this match where you've been finding the most litter on the daily beach cleans?

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3) Which animals are likely affected by microplastics at each site?

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4) Circle all the potential plastic sources in the comic strip of our day to day lives below. Try to add alternatives for as many as you can!

5) List 5 sources of marine microplastics

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6) Think of three ways you could reduce the amount of microplastics and microfibers that you add to the ocean:

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FRESH
FRESH
FRUIT
FRUIT
TOILET ROLL x12
NEWS
HOME

WORK SHEET FOLLOW UP ANSWERS:

1) This should be the seagrass meadow (vegetated area) as the seagrass works as natural filter, trapping particles including microplastics and microfibers in the sediment.

2) N/A

3) All of them! Look to the species tick list and consider the animals found in the BRUV experiment and whilst snorkeling. Microplastics have been found at all levels of the food chain, accumulating as further up the food chain.

4) Plastic bags, cigarette filters, face masks, car tyres, plastic posters, plastic games and toys, wrappers and bottles, small plastic beads in face wash, plastic shower curtain, toilet roll wrappers, clothes pegs, microfibers from clothes wash, plastic news in letter box, plastic doormat.

5) All acceptable answers: **Fishing gear, Clothing, Tyres** (the biggest source of plastic pollution in the UK as small shreds come off the tyres whilst we drive.), **Nurdles** (small plastic pellets that manufactures use to transport plastic - They're bright and colourful making them look tasty for animals.), **Cigarette filters** (the largest man-made contaminant of our seas), **Single use** items such as **plastic bottles, wrappers, bags and food ware, Cosmetics and body/ face washes.**

6) a. Try to avoid buying plastic products all together, bring your own water bottle, buy food with no wrapper or paper, card, tin, glass packaging.

b. Buy second hand and upcycle old items to reduce the overall plastic production.

c. Try to buy products made of natural materials such as cotton, wool or hemp. This is particularly key when buying clothes.

d. Wash clothes as infrequently as possible on a low heat and try to air dry them. This will reduce how many microfibers are released with each wash. Mind you don't get smelly though!

e. Once you've reused an item as much as possible recycle it. The item will still release microplastics but much less than if a new brand-new plastic item is manufactured.

f. There are loads of great tips online to change our day-to-day habits- including home prepping food, simple bathroom routine switches and shopping habits.

g. Avoid eating fish. Abandoned fishing nets are a large source of microfibers, as well as entangling and continuing to catch animals.

h. Write to your MP asking for government bans on single use plastics.