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# Litter detectives

## Sustainability Goals:



## Subject links:

Science, Citizenship

Ages 5-7

## Curriculum key words:

Materials and properties, sustainability, investigation, human impact

## Ocean Literacy Principles:

6. The ocean and humans are inextricably interconnected

## Learning objectives:

- To categorise different materials according to their properties and characteristics.
- To learn about what happens to materials after they have been used, in particular their degradation times.
- To conduct a fair test, develop a hypothesis, observe changes, record data and draw conclusions.

## Resources provided:

- [Marine Litter Fact File](#)
- [Litter timeline \(printed back-to-back\)](#)
- [Our investigation worksheet](#)
- [Curriculum links](#)

## Extra resources required:

- One of each of the litter items from the timeline
- Litter items brought from home
- Hoops

## Step 1

### Background

Litter reaches the ocean in a number of ways: it's washed in from our rivers, is left on our beaches, or is cast overboard from boats. It not only makes the marine environment look unpleasant, but it impacts the health of thousands of marine animals every year, usually by ingestion, entanglement or suffocation. Plastic is the most-commonly found marine litter material, and it does not biodegrade, but breaks up into smaller and smaller pieces which can be mistaken for plankton or other food sources. More information can be found in the [Marine Litter Fact File](#).

For this lesson, ask students to collect three used items from home and bring them into school. These could be items that are to be thrown in the bin or recycled, but they must be clean! Explain that they will be examining the properties of the items, so they should try to bring in things made from different materials.

## Step 2

### Set the scene

#### 15 minutes – What is marine litter?

Introduce the topic by asking the group what marine litter is. Allow students to talk to each other in pairs before having a class discussion. Explain the difference between litter and waste. Assess students' knowledge of the marine litter problem by mind mapping the following questions: how does litter reach the ocean? What is the impact of litter on the marine environment and wildlife?

## Step 3

### Activities

#### Activity 1: 20 minutes – Properties of materials

Look at the items brought in by students and use hoops to group and classify them by different criteria. Start by ordering items by material (plastic, paper etc.). Students should place their item into the correct group, using a different hoop for each material. Ensure students can distinguish between the object and the material it's made of. Discuss the uses of the everyday litter items and share ideas about why they're made from certain materials. Identify the most common material (usually plastic). Encourage students to observe the properties of each item carefully, using touch as well as sight. Repeat the grouping activity, this time comparing and grouping the materials based on their simple physical properties, like whether they're hard or soft, flexible, transparent, waterproof.

#### Activity 2: 15 minutes – Litter timeline

In an open space, lay out the [litter timeline](#) cards in order with the litter items in a rubbish pile in front. Use paper as an example, discussing its properties and encouraging children to think about what they know about paper. Match paper to its degradation time. Emphasise that these are scientists' best predictions, as materials like plastic haven't been around long enough to truly know their degradation times. Invite one child at a time to choose an item and guess how long it's estimated to take to break down. Remind each student to use the paper as a guide.

## Step 4

### Extend

#### 30-40 minutes – Degradation experiment

In small groups, students should discuss ideas for an experiment to test how long litter items might last in the ocean, and how the properties of these materials might change over time. Encourage your group to think about conditions in the ocean that might contribute to degradation, like saltwater, waves and sunlight. Students should consider how to make their experiment a fair test and what items could be used to compare decomposition rates (e.g. apple, paper bag, plastic bag, piece of wood).

Discuss ideas and use concepts from group suggestions to create a class experiment. Ensure that children make a hypothesis and support them to draw conclusions from their investigation. Use the [investigation planner](#) to plot your experiment.

As these items will decompose relatively slowly, we recommend allowing your experiment to run for at least four weeks. Students should take weekly observations and record their findings. Encourage students to ask questions during this process to check their understanding.

## Step 5

### Reflect

#### 5 minutes

Return to the litter items brought in from home. Of these items, what was the most-common material? What are the properties and characteristics of this material? What damage could these items do in the environment? How could we reduce the risk of litter entering the environment?

## Step 6

### Follow up

Our lesson, [how clean are our seas?](#) dives deeper into the effects that litter is having on our ocean.

Our [Artivism](#) lesson is a great way of using the waste items brought in from home to raise awareness of the topic.

# Curriculum links

## England

### Science

- Distinguish between an object and the material from which it is made.
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.
- Describe the simple physical properties of a variety of everyday materials.
- Compare and group together a variety of everyday materials on the basis of their simple physical properties.
- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.

### Citizenship

- Learn what improves and harms their local, natural and built environments and about some of the ways people look after them.

## Wales

### Humanities

- I am beginning to appreciate and care for living things and my own environment.
- I can take care of resources and not waste them, and I am conscious of the importance of creating a sustainable future.

### Science

- I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.

## Scotland

### Science

- Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes.
- Through exploring properties and sources of materials, I can choose appropriate materials to solve practical challenges.

# Marine Litter Fact File



## From source to sea

It is estimated that 11 million tonnes of plastic ends up in the sea worldwide each year (1), and that 80% of litter found in the sea is from inland sources (2).

Sources on land can include intentional and accidental littering, items flushed down toilets, sinks and drains, windblown litter from bins and landfills, and litter carried by rainwater into drains, rivers and eventually the sea. Litter is also a problem at sea, with sources like fishing, sailing, speed boats, commercial ships and container spills causing litter pollution.



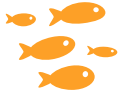
## Litter timeline

Litter in the ocean takes longer to degrade than litter on land, but will eventually start to break up due to wave action, currents, saltwater and sunlight. Degradation time varies greatly depending on the properties of the litter.

Microplastics are a serious environmental issue. They are plastics that have broken up into pieces less than 5mm. However, some plastics enter the environment this size already - like microfibres and plastic nurdles. Nurdles are the small plastic pellets used in the production of plastic products.

1. Pew, 2020
2. Europa, 2016

# Marine Litter Fact File



## Marine life and litter

Litter items can cause harm to all sorts of marine life, from tiny plankton to huge whales.

Animals can become entangled in litter, causing injury, reduced mobility and even death. Ingestion of litter, particularly plastic, is very problematic for marine life as they are unable to digest it. Large amounts of plastic ingestion can lead to starvation, as there is no room left for food. One study found 100% of turtles sampled to have plastic in their stomach (3). In some areas, the extreme amount of plastic on the sea floor can suffocate the animals and plants living there.

### Invasive species

Ocean currents can move plastics around the world. Small animals and plants can hitch a ride on the surface of plastic and travel with the currents, introducing non-native species to new areas. The introduction of non-native species could cause harm to the ecosystem.

### Plastic chemicals

Several chemicals used in the production of plastic materials are carcinogenic. Toxic contaminants can also accumulate on the surface of plastic materials that have broken up and been underwater for a long time. When marine animals ingest plastic accidentally, these toxic contaminants enter their digestive systems and could build up in the food web over time.



Gannet carrying fishing rope  
📷 JHS Archer-Thomson



Microplastic pieces within seaweed  
📷 Natasha Ewins

# Marine Litter Fact File



## Litter surveys

Litter surveys are not only important for clearing rubbish, but also for gathering data on the types of litter polluting our environment. [Beachwatch](#) is our national beach clean and survey initiative, and has been running for nearly 30 years. Our brilliant volunteers head out to beaches across the UK to clean and survey our coastline, collecting and recording the rubbish they find within a 100m stretch of beach. This litter data helps inform our campaigns and lobby government, and has led to influential changes like the UK-wide carrier bag charge, microbead bans and changes to wet wipe packaging.

We also use the data to determine the sources of litter. For example, if a significant amount of sewage-related debris (SRD) is found in an area, we work with local sewage treatment companies to try to improve treatment plants, and with communities to raise awareness of what should and shouldn't be flushed down the toilet.



## Reducing litter

We all need to do our bit to reduce litter in the environment. By rethinking how we shop and what we use in our daily lives, we can all make a difference. Refusing unnecessary plastic and other materials, reducing the amount of products we consume, and repairing rather than replacing are all important actions we can take. Through education, we can help raise awareness, encourage positive consumer behaviour, and campaign for change from businesses and the government.



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# Marine Litter Fact File



## Recycling

Even if we reduce the number of items we use, we will still need to throw some away. This is where efficient recycling is key. Download a guide from your local council to help students understand what can be recycled at home and at school. Many items can be recycled, but if your local council has limited recycling options check out [Terracycle's website](#) for local drop-off points.

Plastics can only be recycled at best 2-3 times before they lose their strength, so we still need to move away from plastics to materials that can be recycled time and time again. We need to change how products are recycled, and how we incentivise best practice to ensure materials and resources are valued. This could include redesigning products or calling for economic incentives like Deposit Return Schemes (DRS), where a small deposit is paid when consumers buy a single-use drinks container and is refunded when they return it to a store or dedicated recycling point.



## Circular economy

We currently have an economy which is linear, which means we make, use and dispose of products using up finite resources. It's estimated that only 9% of all plastic ever made has been recycled (4), so we know that recycling alone isn't the solution. Instead we need to move towards a circular economy, where products are designed to be used time and again, repairable, or re-purposed as new products. The whole life cycle of the product has been considered, so very little ends up in landfill.



Litter collected at a beach clean  
📷 Natasha Ewins



Single-use plastic straws  
📷 Natasha Ewins

4. Geyer *et al.*, 2017

# Paper



# Weeks

# Cardboard



# Months

# Balloons



**4 years**

# Plastic bag



**20 years**

# Crisp packet



**75 years**

# Drinks can



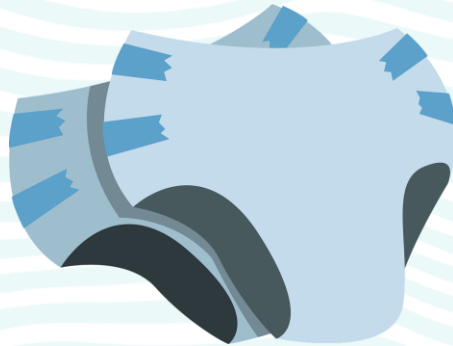
**200 years**

# Plastic bottle



**450 years**

# Disposable nappy



**500 years**

# Glass



**Forever?**

# Our Investigation

Name:

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*We are finding out about...*

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*This is what we will do...*

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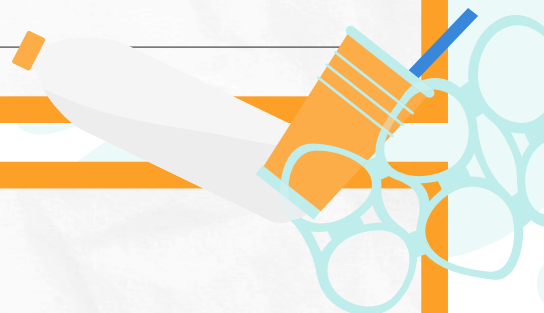
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*This is a picture of what we will need*





*We will make it a fair test by...*

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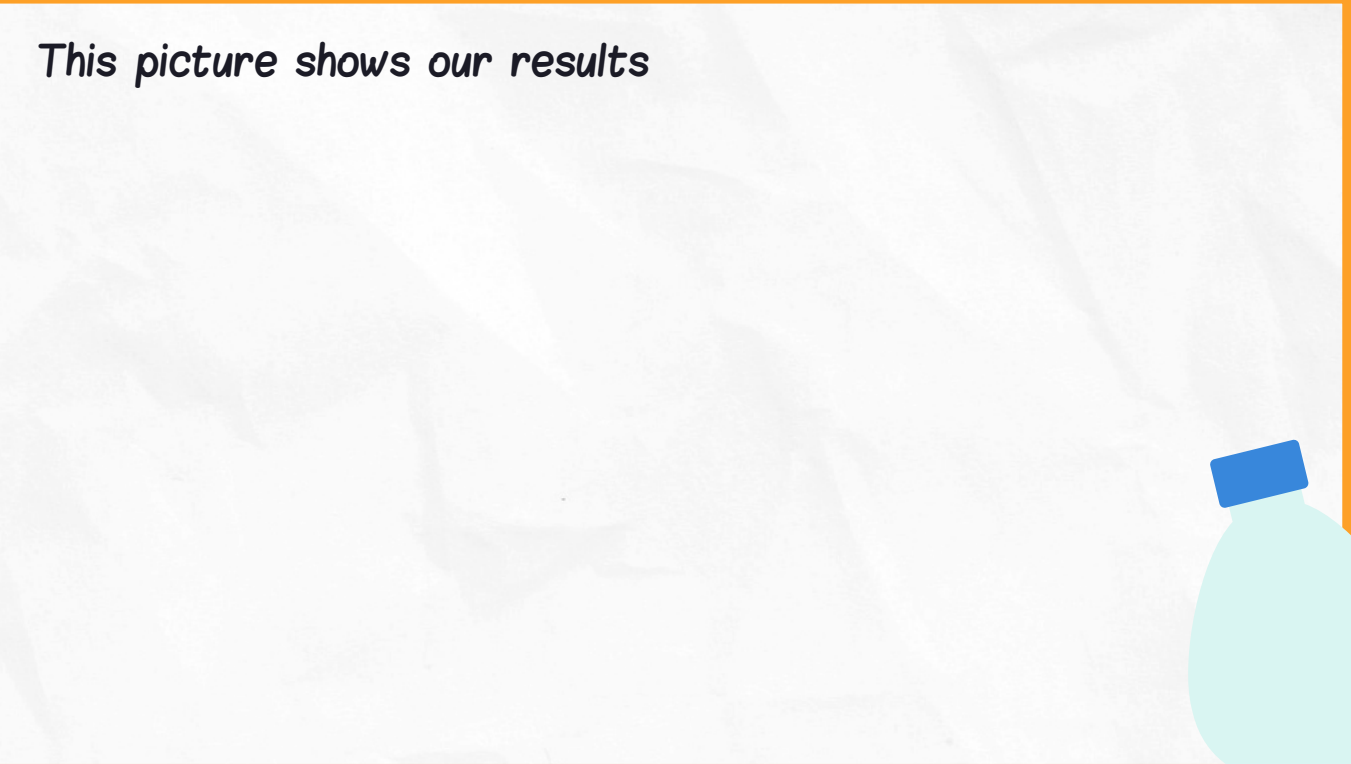
*What I think will happen...*

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*This picture shows our results*



*We found out that...*

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