

RECONNECTING WITH THE RIVER

KS3 GEOGRAPHY / SCIENCE

Introduction

London relies on a 150-year-old sewer system built for a population less than half its current size. As a result, millions of tonnes of raw sewage spills, untreated, into the River Thames each year.

We are now building a 25km Super Sewer under the Thames to intercept those nasty spills and clean up our river for the good of the city, its wildlife and the people of London.

Thames Tideway Tunnel will create a cleaner, healthier river.

Lesson context, approach and purpose

This lesson has been created to assist KS3 science and geography teachers – help to facilitate learning around food chains and food webs using the River Thames and Thames Tideway Tunnel as the context. The resource will provide additional stimulus to further student understanding of the past and future challenges and opportunities presented by human activity on the River Thames and explore how a vibrant and ecologically sound River Thames will support tourism, transport and preserve and sustain fishing industries through healthy marine life.

The lesson can be executed within a 60 minute period or within a short 20 min session.

The resources link well to the KS3 STEM Activity – Activity 3 Thames Twitchers

The activity can be introduced using the TBM app and a short presentation to introduce the Thames Tideway Tunnel to give context to students' learning.

Learning Objective: 60 minute Lesson

As a result of participating in this teaching episode, students will be able to:

- Explain what a food chain shows and construct a food web
- Identify the risks to an ecosystem of toxic pollution
- Describe how the function of the River Thames has changed over the years and will continue to change
- Understand how Tideway delivers on its environmental responsibility

Curriculum links:

Geography

KS2

- Human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water.

KS3

- Understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems

GCSE

- examine ways of life and contemporary challenges arising from and influencing urban change.
- draw out the interdependence of climate, soil, water, plants, animals and humans; the processes and interactions that operate within them at different scales;

Science:

KS2:

- Recognise that environments can change and that this can sometimes pose dangers to living things.
- Construct and interpret a variety of food chains, identifying producers, predators and prey.

KS3:

Relationships in an ecosystem:

- the interdependence of organisms in an ecosystem, including food webs
- how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

GCSE:

- describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem
- describe the importance of interdependence and competition in a community.

This lesson is designed to take around 60 minutes. However the structure is flexible and can be adapted to a variety of settings and contexts.

What you will need:

- Reconnecting with the River – PPT Intro 60 min Lesson
- Reconnecting with the River – Resource sheets 1, 2 and 3

60 Minute Lesson Plan:

1. Share the outcomes with students and explain that the lesson will be about the general theme of the River Thames, looking at it in various ways.
2. Develop this by showing **Slide 3** and using these, or other, leading questions. Draw out ideas from students but don't validate them at this stage. Use this to develop a sense in the group of what people know about and might be interested in.

Phase 1: Ecosystems

KS2/KS3

3. Show **Slide 4** and explain that the first part of the lesson is going to be about ecosystems. Explain that the Thames is a massive ecosystem, that it supports a variety of life (and could support more) and that not all of this is visible. Explain as well that ecosystems vary hugely in size; the ecosystem for a lugworm is much smaller than that for a heron.

The class may be familiar with the concept of predator prey relationships and this will influence the amount of time spent on this and the next two slides. If necessary, explain the terms and give a couple of examples.

Then explain that these can be represented as food chains.

4. **Slide 5** gives an example of a food chain and makes several key points:
 - a) Food chains start with a producer and for marine systems this is often phytoplankton. Although microscopic, it is crucial.
 - b) The different levels have terms, e.g. secondary consumer.
 - c) The arrows show the flow of energy (and not 'what eats what')
5. **Slide 6** then expands this from food webs to food chains. This is important because it shows how organisms can affect each other, even if neither preys off the other. The Dace, for example, has a range of prey. If one of these is in short supply it will switch to another. What a food web doesn't show, of course, are the numbers. The trout will eat many tadpoles. This is important later in the lesson when pollution is explored. If each of those tadpoles has taken in a tiny amount of some material that has been dumped in the river, this may accumulate in the trout.
6. The next part of the lesson involves constructing a food web. Ask students to work in small groups; each group will need a set of eight cards (downloadable as Resource Sheet 1; cut up into set). The cards represent organisms that live in, or near to, or visit the Thames; the task is to use these to construct a food web. A good way of doing this is to provide the group with a large sheet of paper, such as flip chart paper. On this they can:
 - Set the cards out according to predator prey relationships
 - Add arrows to show the flow of energy
 - Add labels to show 'producer', 'primary consumer', etc. (Note here that the Dace is, in this food web, both a secondary and a tertiary consumer).
7. **Slide 8** can be used to check answers (note that students webs may not look quite the same – the three primary consumers can, for example, be in any order horizontally). There are some questions that students can explore using their food web. These start off with closed questions and become more open. You may wish to add more.

KS3 Only

Note to reader: the text within Slide 9 is for KS3 students only.

8. **Slide 9** asks students to apply the idea of trophic levels to the food web and also poses questions about applying ideas of interdependence and competition to it. These are intentionally more open ended questions and are aimed at higher attaining students.

KS2/3

9. **Slide 10** asks students to consider the effect of pollution. It is worthwhile pointing out that this can take many forms – not simply 'dirt'. The food webs can be used again to help students answer the later questions.

Phase 2: The Thames through the Years

KS2/3

- 10. Slide 11** is designed as an introduction to part 2. The idea is to get students thinking about some of the different functions a river might have. It is not necessary that the Thames itself fulfils (or has ever done so) a particular function but that the activity encourage ideas more generally about rivers. Gather and display these ideas.
- 11. Slide 12** lists some of the functions the Thames has fulfilled in the past or present. Explore these so that students understand what is there and use to validate their ideas. Now ask them to work in small groups and suggest whether they think that each of these uses has, over the last 100 years:
- Increased
 - Decreased
 - Stayed the same

These are provided on cards that can be discussed and moved into piles (downloadable as Resource Sheet 2; cut up into sets). It is useful to ask to students to justify their decisions.

- 12.** Show **Slide 13** and ask students to re-sort their cards. This time they need to select three that they think represent the three functions that will grow the most over the next 100 years. Encouraging them to articulate why, will be useful.

Ask the small groups to pair up and share ideas. It may be that some of their ideas are the same. The ones that aren't can then be discussed and, if possible, agreement reached. The larger groups can then compare their ideas. Again, it is the reasoning that is more important.

- 13. Slide 14** asks students to suggest how human activity has impacted on the river, and how the river is different as a result of settlements. This can be used to challenge them to think about both types and scale of impact.

Phase 3: Improving the Thames

KS2/3

- 14.** The Tideway construction project will benefit London for decades to come. However it is inevitable that there will be some short term inconvenience from the work being carried out. The construction team have, as part of their remit, an obligation to carry out a wide range of improvements to the area. Some of these are listed on **Slide 15** (a full list is available on the [Tideway website](#)). Introduce these to students and ask them to consider which they think will have the greatest impact on the area. Draw attention to these and clarify any that students are unsure about.
- 15.** Now ask students to take these ideas (provided as a set of cards, downloadable as Resource Sheet 3; cut into sets) and sort them into a 'diamond 9' formation. The instructions for this are on the slide; it is, in essence, a priorities debate. If time allows encourage groups to share and justify their ideas. It could be that students are encouraged to, having listened to other people's views, change their own arrangements.
- 16.** Finally, draw attention to the outcomes and take feedback from students about what progress they have made and what they now understand.

20 Minute Lesson Plan:

This lesson is designed to take around 20 minutes. However the structure is flexible and can be adapted to a variety of settings and contexts.

What you will need:

- Reconnecting with the River – PPT Intro 20 min Lesson
- Reconnecting with the River – Resource Sheet 1

Learning Objective:

As a result of participating in this teaching episode, students will be able to:

- Explain what a food chain shows and construct a food web
- Identify the risks to an ecosystem of toxic pollution
- Describe how the function of the River Thames has changed over the years and will continue to change
- Understand how Tideway delivers on its environmental responsibility

Curriculum links:

Geography:

KS2

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20. Minute Lesson Plan:

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KS2/3

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RECONNECTING WITH THE RIVER:

RESOURCE SHEET 1

Seal - eats fish and shellfish



Cormorant – eats fish



Dace – eats small fish, zooplankton and snails



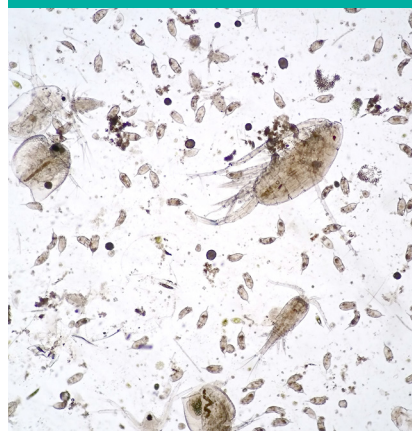
Mussel – eats plankton



Minnow – eats zooplankton



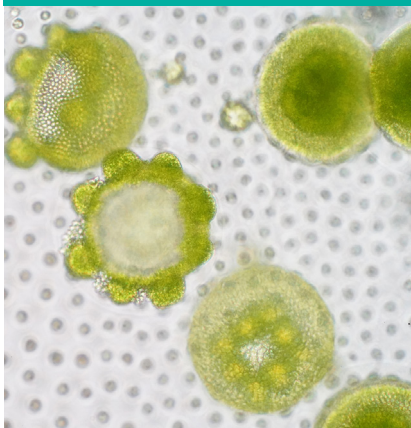
Zooplankton – eats phytoplankton



Snail - eats phytoplankton



Phytoplankton



RECONNECTING WITH THE RIVER:

RESOURCE SHEET 2

1

Transport -
enabling people
to travel and to
enable goods
to be moved
as well

2

Power - driving
machinery
through
water wheels

3

Food - catching
fish and other
marine life

4

Sewerage
- carrying
excrement
away in
the water

5

Waste disposal
- carrying
rubbish away
in the water

6

Sport - racing
boats and craft
of many sizes

7

Supply of
drinking water

8

Entertainment
- pleasure
boat trips on
the river

RECONNECTING WITH THE RIVER:

RESOURCE SHEET 3

Removing
litter

Transporting
material by
river to reduce
lorry journeys

Strengthen
river walls

Re-open more
sections of
the riverside
pathway

Employ local
people

Provide
apprenticeships

Employ local
people

Provide
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Re-open more
sections of
the riverside
pathway