Aire Rivers Trust

Connecting
People.
Places.
Nature.

DEFENDING THE NATURAL AIRE

DEVELOPING THE NATURAL AIRE

USING OUR RIVER TABLE

OUR RIVER TABLE

For support: contact@aireriverstrust .org.uk
Telephone: 01274 061902

Our river table is designed to help you explore with your class a number of topics in the Geography National Curriculum. You can create really world conditions in miniature to watch them happen faster and in a more controlled manner.

This resource was bought for the Aire Rivers Trust as part of the Developing the Natural Aire project. Funding from the Environment Agency, the National Lottery Heritage Fund, Yorkshire Water and Craven Council is reconnecting the river ecosystem and local communities to their river. Through this project we will allow Atlantic salmon to return to the River Alre and equip volunteers and school children to be the future custodeons of our great river.

Using this river table you can teach:

- The parts of a river.
- The process of erosion, deposition and transportation.
- How oxbow lakes form.
- Permeable and impermeable land
- How farming can accelerate erosion
- How we can protect land from erosion.
- How weirs, bridges and culverts change the flow of a river.
- Point vs diffuse pollution.

RIVER DEFENDERS

River Defenders is our education programme designed to teach children about the geography and ecology of our great river. We hope to inspire them to study STEM subjects and to consider future careers caring for our environment.

Where we are able we deliver a three session programme in schools consisting of two afternoon school sessions and a riverside visit. These are delivered by our undergraduate placment student.

To adapt our delivery we are offering schools equipment loans, careers talks, providing sample of river invertebrates and delivering stand alone riverside study sessions. Please chat to us about how we might be able to support you.

DEVELOPING THE NATURAL AIRE

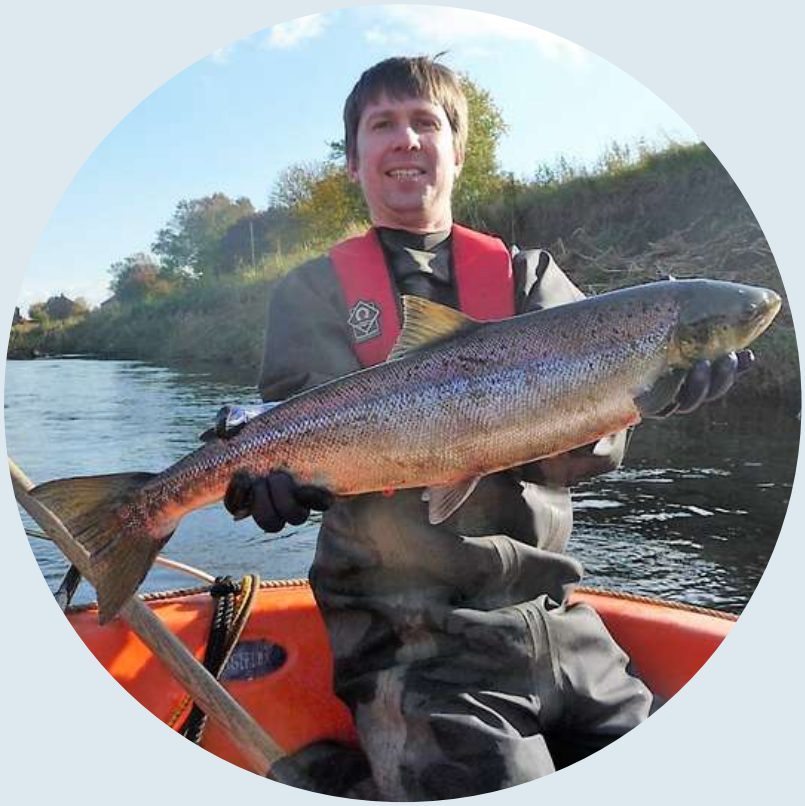
The Aire, like many other rivers in the industrial areas of the country suffered greatly over the past two centuries from our industrial heritage. Pollution from our factories and sewers is now rare but the weirs that provided the mills with water remain.

These weirs block the way for migrating fish. All fish need to move to feed, breed and shelter. For Atlantic salmon, their goal is to reach historic spawning sites in the shallow spawning gravels in the upper parts of our river.

Developing the Natural Aire (DNAire) is reconnecting 60km of river to allow Atlantic salmon to return to their home in our river. This is being done through the building of fish passes on the four largest weirs left on our river in Saltaire and Leeds.

This re-connection of the river benefits other fish species including course fish, Lampreys and Sea Trout. With more resilient fish populations in the river you can expect to see more riverside wildlife such as kingfishers and otters.

The unique baffles in the base of a fish pass that slow the flow to let fish swim over weirs



The inspiration for our project, salmon caught in the lower Aire

CONDITIONS OF LOAN

This table should stored securely and either assembled or flat on a level surface. It should be assembled by adults.

The pump is PAT tested and the provided RCD breaker plug should used.The Aire Rivers Trust accepts no liability for water damage associated with this table.

The table should be operated under adult supervision.

BEFORE YOU SET UP THE RIVER TABLE

Assembling the table is a two or three-person job. The plastic media (sand) and table sections are heavy.

The sand needs to be equally divided between the buckets for transportation with the supplied trolley. The furniture dolly wheels can be used to move the table along smooth surfaces.

This table needs to be set up on a waterproof, level surface.

Is there a nearby electrical socket and tap? Care should be taken to ensure that no power leads are left as trip hazards. Consideration should be given to how you will empty the stream table afterwards. Is there a nearby drain or area of soft ground?

SETTING UP THE RIVER TABLE

Place the trestle table legs out in their approximate position. Lift one half of the table onto its legs. Ensure all connecting hinges are folded back before positioning the second half. Ensure that the rubber seal is free from debris and sand. Lift the second half onto its legs next to the first and then click down connecting levers to join them.

Place the large black sump bucket under the drain hole of the table. Connect the pump hose to the table by screwing it into place. Place the pump in the sump bucket.

Hang the XXXX switch on the bracket in the sump bucket. The pump will not work if this is not in an upright position.

Ensure the perforated, grey diffuser is in place. Add the grey panel with a cut out to restrict the flow to one location.

Fill the table with all the supplied plastic media (sand). Roughly shape a valley leading from the cut out. Add meanders and make sure it widens to form a mouth. Leave a good 30 cm of space (for the delta) between the mouth of the river and the drain of the table.

Plug in the pump using the RCD breaker plug.

The pump will operate at a speed far in excess of that needed to create a river. Ensure the tap on the hose is in the horizontal / off position. Turn the pump on at the socket. The pump will still safely operate with the valve closed.

To make the river flow turn the tap XXXX wise within the green area. Do not turn it as far as the red area. To stop it turn it back (or drop the switch from the bracket in the sump bucket).

PARTS OF THE RIVER TABLE

Parts:

1. black legs/stands x4
2. Black bucket which pump will be placed
3. 2 clear parts that clip together. One end has a hole so water can go into bucket, other one has a port where the pump will be.

4. Troughs with sand/sediment
5. extension cable to plug pump into
6. a water source to fill black bucket
7. Grey structures to place into table as seen above.
8. pump

DISASSEMBLING THE RIVER TABLE

Scoop all the plastic media (sand) back into the trugs. This is fairly time-consuming process but the plastic media is expensive and will persist as plastic pollution on the ground. This can be done with the shovels, brushes and sieves.

The plastic media (sand) and table sections are heavy. The sand needs to be equally divided between the buckets for transportation withthe supplied trolley.

To drain the table remove the two rubber bungs either side of the drain. It may be worth holding a sieve under these. When the table is almost empty the table can be tilted by lifting at one end to help it drain.

You can empty the black plastic sump bucket using the hose at full pressure.

Unclip the sections and carefully disassemble. Each lift is a two-person job.

Please do not store the sections leaning against a wall wherethey might fall.

Please be careful not to scratch them too.

TEACHING WITH THE RIVER TABLE

Using this river table you can teach:

- The parts of a river.
- The process of erosion, deposition and transportation.
- How oxbow lakes form.
- Permeable and impermeable land
- How farming can accelerate erosion
- How we can protect land from erosion.
- How weirs, bridges and culverts change the flow of a river.
- Point vs diffuse pollution.

THE PARTS OR THE RIVER

Create an idealised river valley. It doesn't have to have water flowing through it but it helps students visualise it.

Either share out the labels or hold up one at a time. Ask pupils to locate them on the river table and place them there.

Each label is accompanied a picture of an example from the Aire catchment. You can extend this task by locating these on a map.

The lablels and pictures can be found in appendix 1.

EROSION, DEPOSITION AND TRANSPORTATION

These can be observed in a bend on the table. Create a wide meander as it will show the processes easier. Erosion can be observed on the outside of the bend and deposition on the inside.

Ask students to watch the plastic media granules closely. Can they see them moving?

The processes are created by fast (erosion) or slow (deposition) flow rates. It can be easier to spot the water rate by dropping droplets of the drain tracing dye into the water. Watch the speed with which it moves. Mix according to instructions on the packet. Careful, you won't need to add much!

Transportation can also be observed along the river. As the river widens and slows more sediment is dropped; by deposition. One of the things we are often asked by adults at shows is why the government doesn't dredge the rivers anymore. The members of the public think that sediment fills up the river and creates flooding.

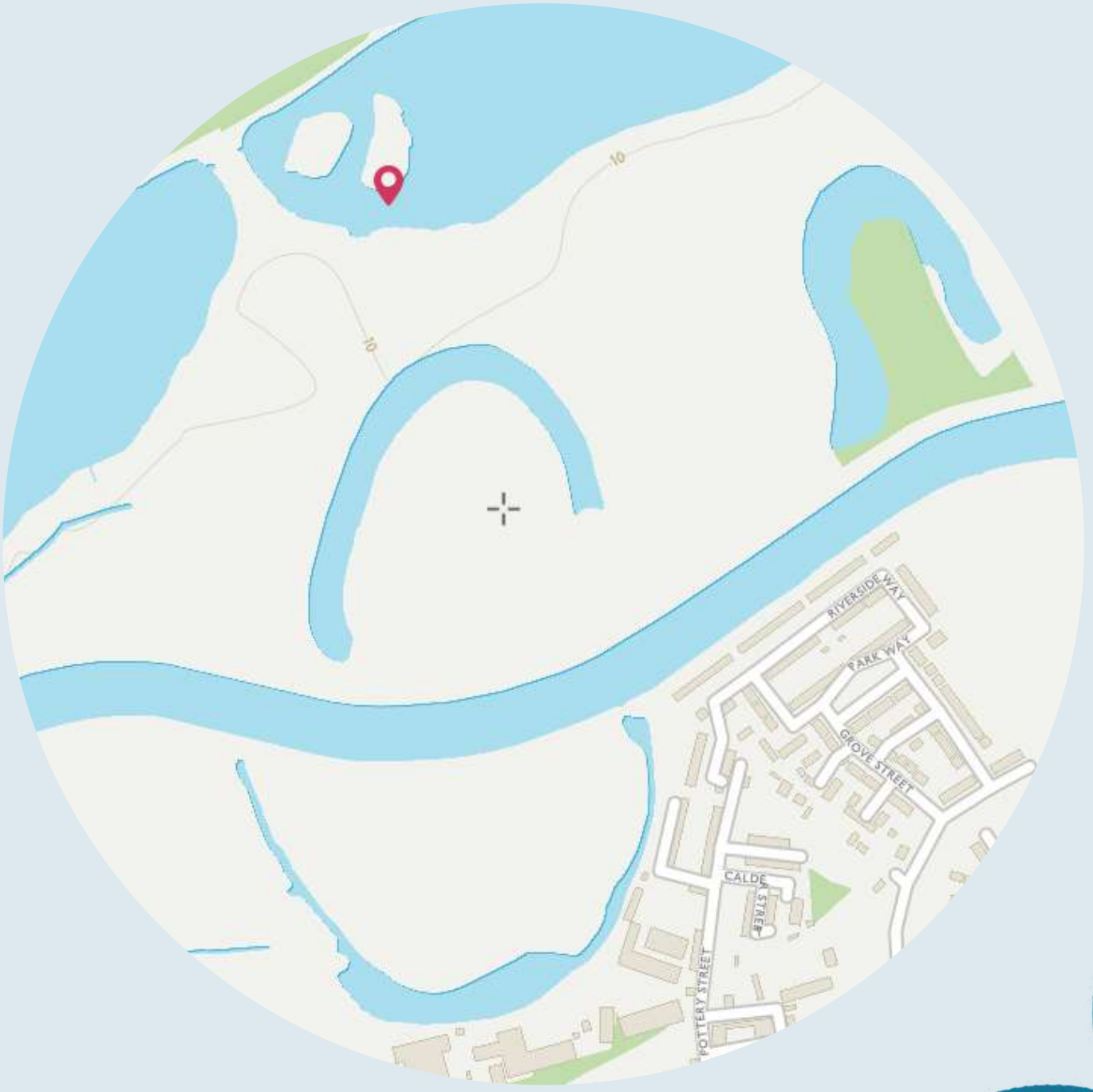
Try an experiment to show why. Using your hand dig out the sediment in the bed of a wide section of the river. What happens?

The extra space in the river creates a faster flow and drags in more sediment from upstream by transportation. As this water slows it deposits it. Dredging is a job for life! It just creates the need for more dredging. It is rarely the answer to flooding (except in some very flat places like the Somerset Levels).

The solution to flooding is creating space for floods (by not building on them); protecting homes and industry by building walls; or slowing the flow of water from the hills.

HOW OXBOX LAKES FORM

With a lot of patience and a wide meander you should be able to form an oxbow lake. This may be easier by returning to a running table of a time lapse camera. Below is an OS map of several Oxbow Lakes near Castleford.



PERMEABLE AND IMPERMEABLE LAND

Using the watering can shower water on a hillside. What happens?

Its soaks in. If the shower is very heavy some flows off. This is because the media has become saturated and cannot let any more water flow through it.

You can create an impermeable surface with the plastic sheeting.

Look at what happens when it showers. What impermeable surfaces do we build in our towns and cities? What happens as we add more of them? This can be one of the causes of flooding.

HOW FARMING CAN ACCELERATE EROSION

You can simulate different ground cover by adding towelling to simulate crop cover. Compare the effects of “rain” produced with the watering can on a hillside with vegetation on it and a bare hillside.

Farming can be a major source of sediment pollution into our rivers. As can building sites. The sediment covers gravel in the bed of the river that fish use for spawning (laying eggs). It can also bring nutrients into the river that reduce the oxygen available to fish and invertebrates through chemical processes.

Another source of sediment is farmers letting cattle drinkfrom the edge of the river. Your students can simulate this with the plastic animals! Watch as the bank collapses as animals “walk” up and down it.

You can also use dye and pour it over the 'farmland' and see how it leaches into the river.

HOW WE CAN PROTECT LAND FROM EROSION

Different methods of bank protection can be simulated. These are:

- willow spilling using the fuzzy radiator cleaner. Willow spilling is the planting of willow rods along the bank and then weaving more through them. The willow will grow roots and create roughness
- along the river bank as well as binding it together.
- natural vegetation using towelling (in a similar manner to the previous experiment).
- hard protection using strips of plastic. These represent walls. Watch how the water flows rapidly along them. You will notice more erosion beyond them. How would you feel if a neighbour erected them?

HOW WEIRS, BRIDGES AND CULVERTS CHANGE THE FLOW OF A RIVER.

This experiment is generally easier if the river table is empty of sand.

By adding the models of bridges, weirs and culverts you cansee how they change the flow of the river. Use the grey blocks to restrict the flow so that your feature goes across the entire model. These need weighting down as they are hollow and float.

You will see that water is held back by the weir. This can be easier to see if the mark the level of the water either side of your blockage with a china graph pen before and after adding.

Weirs are barriers in the river and create unnatural flow conditions. Fish cannot swim or migrate over them as they are too tall; too steep; too long or have shallow bases (unlike waterfalls that have deep pools to get the power to leap from). The water above them is slow and quite unlike the faster water found in the rest of the river. Sediment collects here. As can pollution or predators.

Conversely the flow through bridges and culverts can be too fast for fish to swim through.

We have a Youtube video using the river table on this: https://www.youtube.com/watch?v=_iVcM9AutL4&t=12s

How structures in the river change river flow

POINT VS DIFFUSE POLLUTION

You can illustrate the different between these using a pipette and a watering can filled with drain dye. How far does each appear to persist within the river?

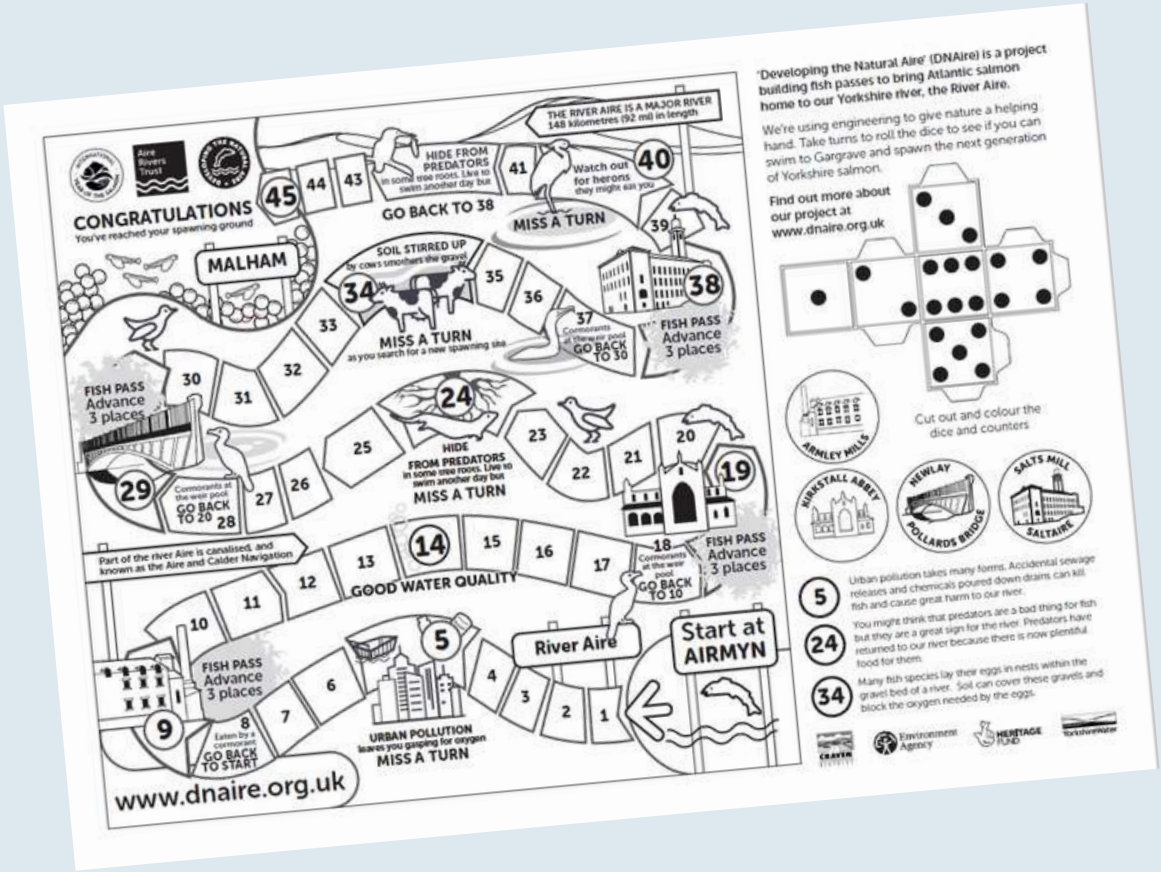
THE THREE P'S

ENJOYING YOUR RIVER

One of the aims of this project is to encourage people to explore their river. Sometimes people have never visited their local river because they didn't know where it is. Sometimes they are unsure what they might do when they get there.

To help people enjoy the river we produced a set of family activity postcards. One of the ones we're most excited is about helping people become salmon spotters. DNAire is reconnecting the river to allow Atlantic Salmon to return. Often the first signs of success aren't found in monitoring by professionals. It comes from enthusiastic anglers or walkers. You may find Salmon redds or nests in the gravelly bottom of the main river around Skipton or in shallow becks like Harden Beck and Eller Beck.

Salmon redds will appear as lighter areas of gravel. You may even see pairs of adult Salmon spawning. We hope one day people will share their discoveries with us.



Salmon redds will appear as lighter areas of gravel. You may even see pairs of adult Salmon spawning. We hope one day people will share their discoveries with us.

Malham Cove

Source

Stream

Otterburn Beck

Mouth

The mouth of the River Humber
Photo © Thomas Nugent (cc-by-sa/2.0)

The Humber Estuary
Photo © Mat Fascione (cc-by-sa/2.0)

Delta

Tributory

River Worth passing through Keighley
Photo © Chris HEaton (cc-by-sa/2.0)


Harden Beck in Bingley

Waterfall

Channel

Volunteers doing a fish survey in Bradford Beck

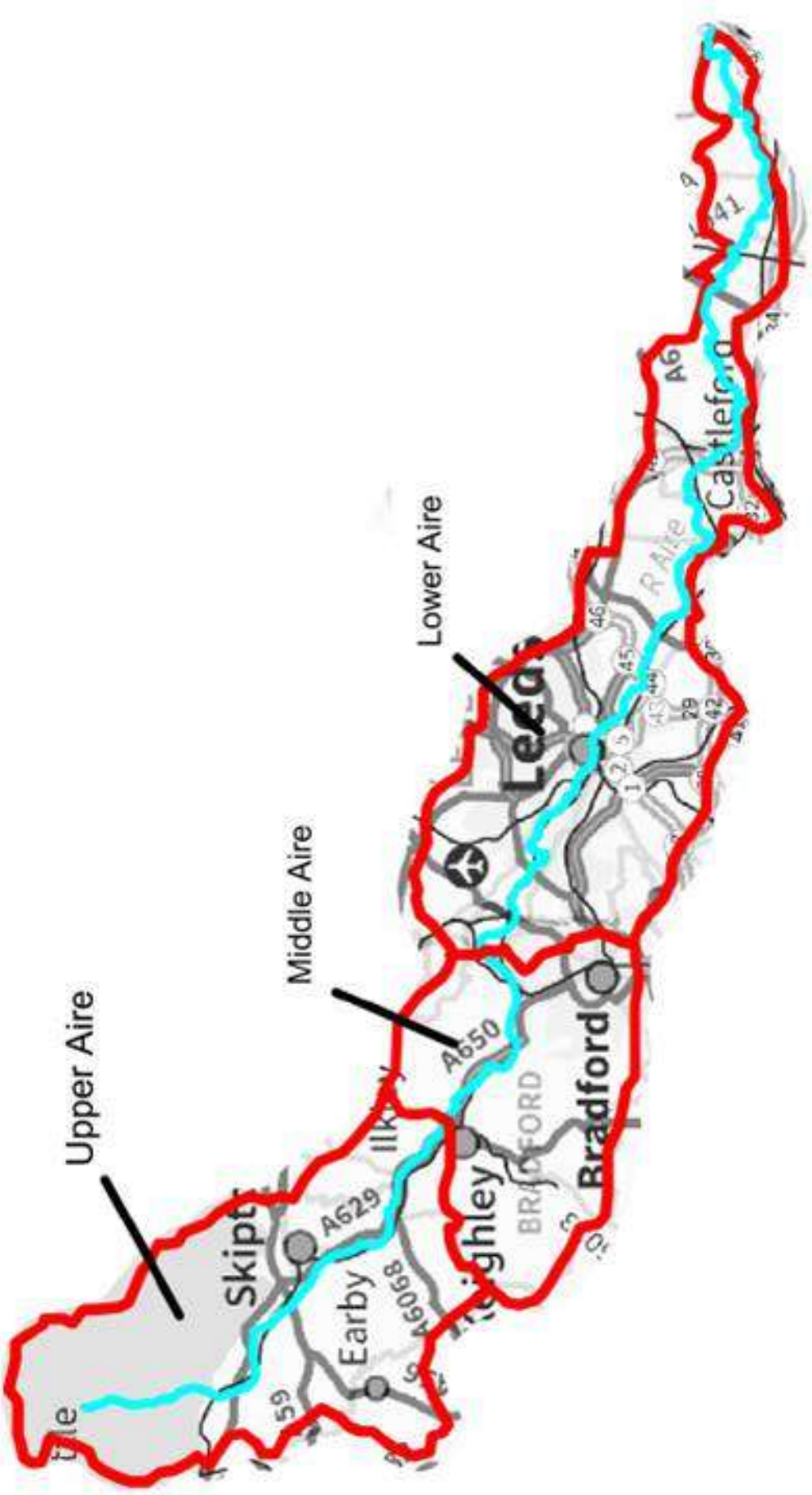
River

River Aire at Gargarve

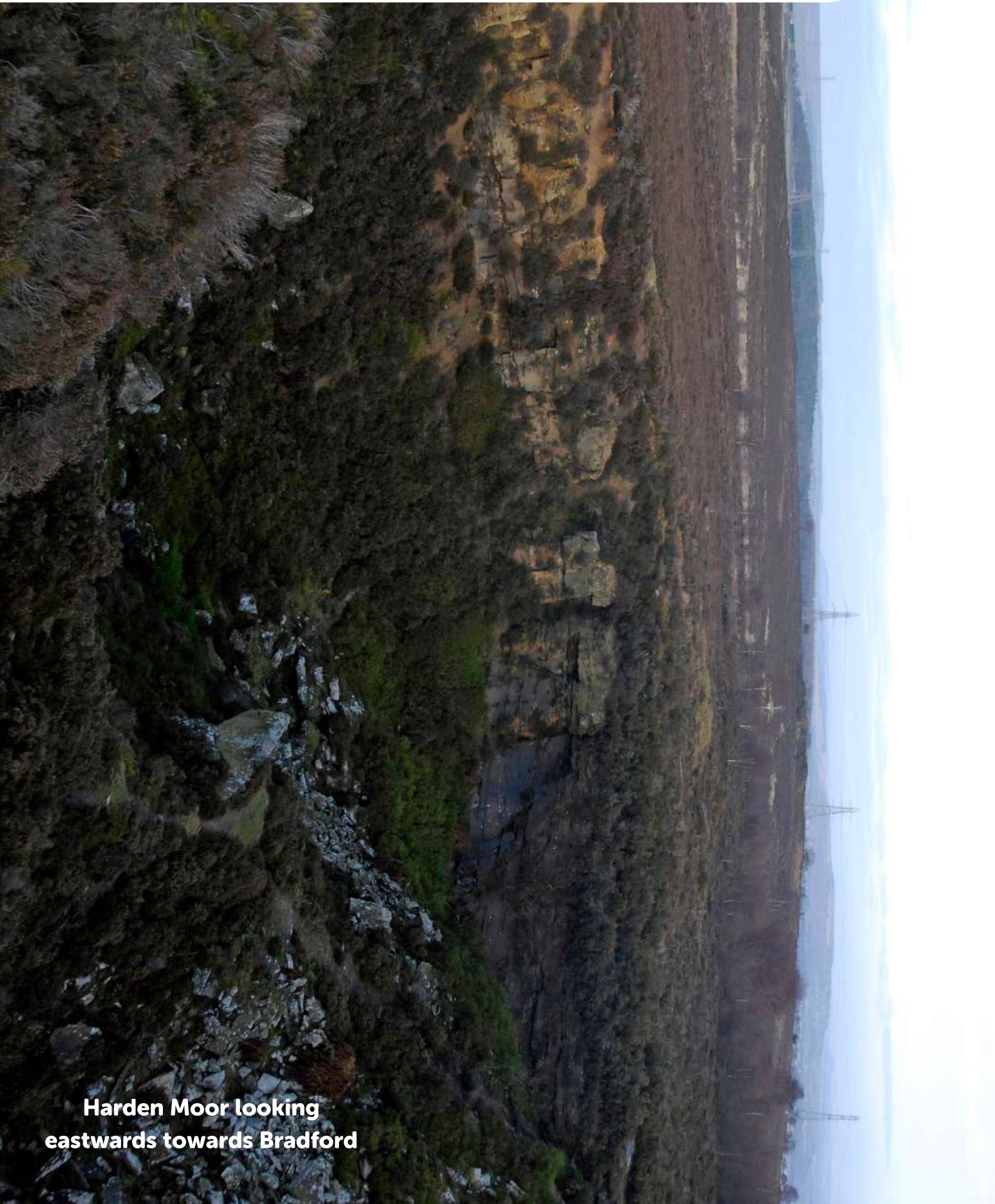
Confluence


JOHN W. LAYCOCK Ltd
River Aire
River Aire
Leeds & Bradford
Steampunk Market
Florist St
Worth Ave
Worth Ave
Hallows Rd
Florist St
Kinara Ct
River Worth

Catchment


Upper Aire
Middle Aire
Lower Aire
Skipton
Earby
Keighley
Bradford
Leeds
Castleford
A629
A650
A6068
A6
R Aire

Watershed



Harden Moor looking eastwards towards Bradford

Valley

River Aire below Malham

Floodplain

Flooding alongside the River Aire at Selby

Bank

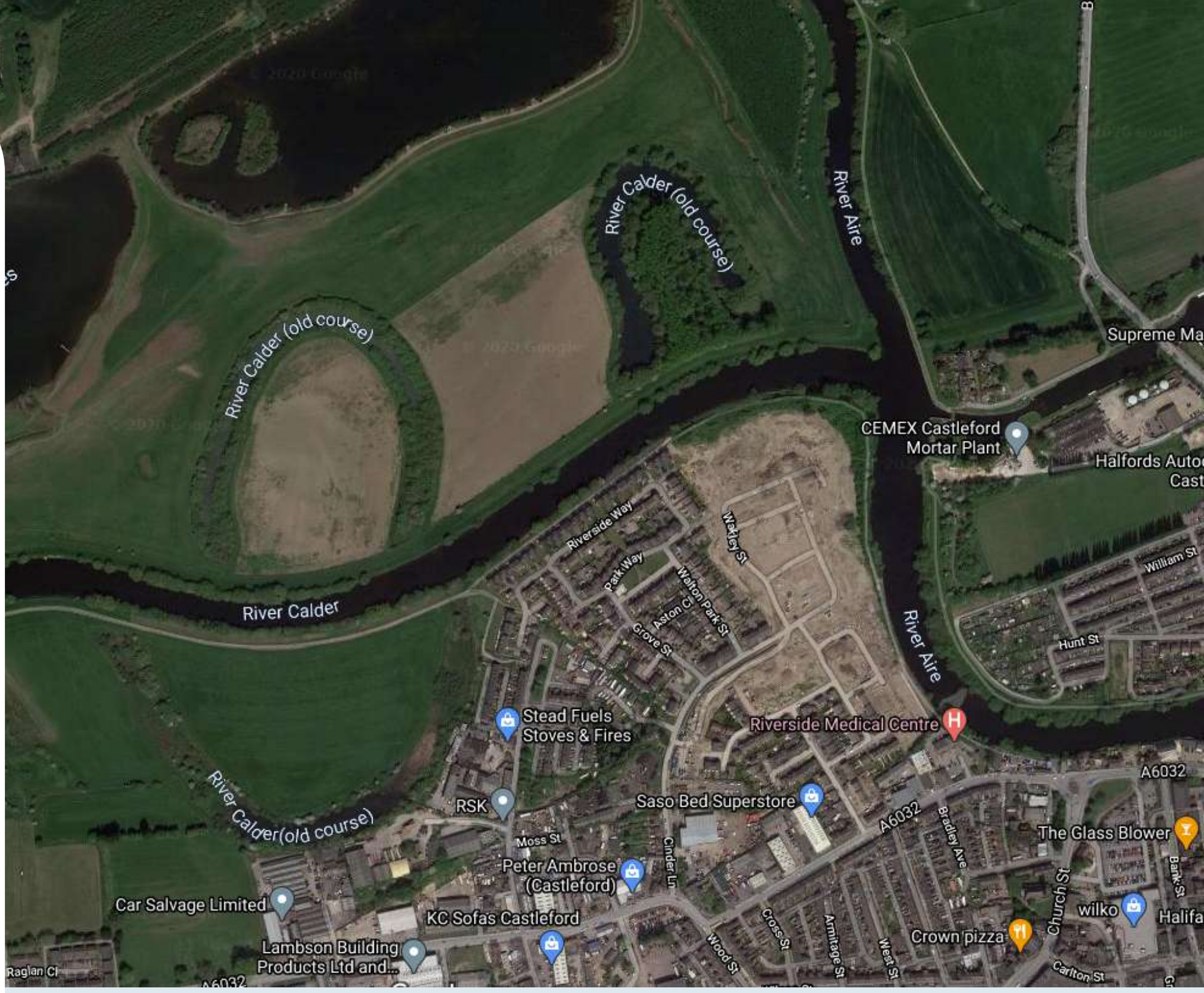
River Aire at Cononley

Riverbed

Meander

River Aire just above Gargrave

Oxbow lake

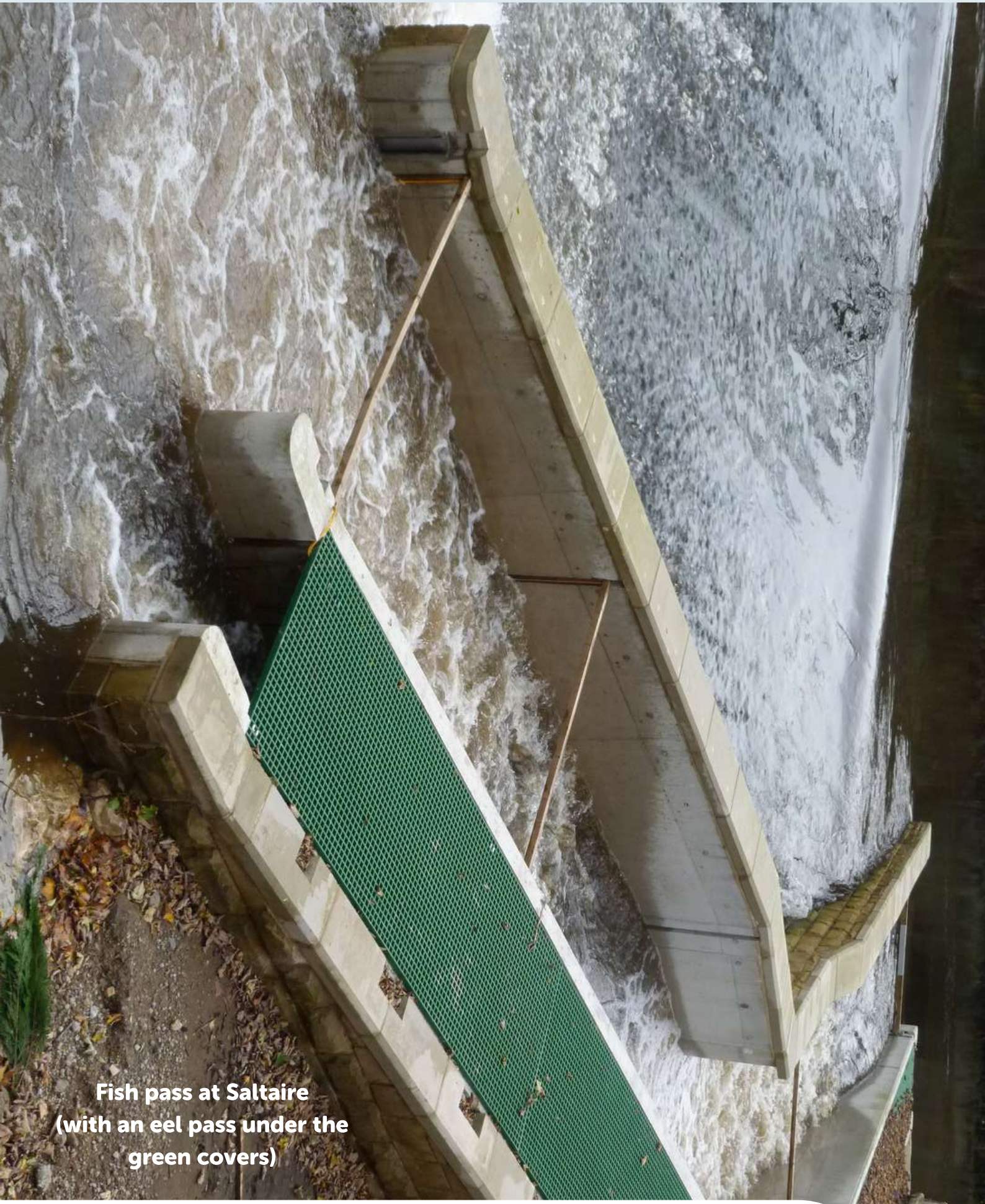

River Calder (old course)
River Aire
River Calder (old course)
River Calder
River Aire
River Calder(old course)
Supreme Ma
CEMEX Castleford Mortar Plant
Halfords Auto Cast
Riverside Way
Park Way
Aston Cl
Grove St
Walton Park St
Wakley St
William St
Hunt St
Stead Fuels Stoves & Fires
Riverside Medical Centre
A6032
RSK
Saso Bed Superstore
Moss St
Cinder Ln
Peter Ambrose (Castleford)
Bradley Ave
The Glass Blower
Bank St
Car Salvage Limited
KC Sofas Castleford
Lambson Building Products Ltd and...
Cross St
Wood St
Armitage St
West St
Church St
wilko
Halifa
Crown pizza
Carlton St
Raglan Cl

Erosion

Erosion on the outside of a bend at East Riddlesden Hall, Keighley

Deposition on the inside of a bend at East Riddlesden Hall, Keighley

Deposition



Fish pass at Saltaire (with an eel pass under the green covers)

Fish pass

Weir

River Aire at Kirkstall Abbey

Notes

Our river table can be booked for free by any school within the Aire catchment (Craven, Bradford and Leeds)

For further support
ring 01274 623400 or email
simon.watts@aireriverstrust.org.uk

Environment Agency

CRAVEN IN THE YORKSHIRE DALES DISTRICT

HERITAGE FUND

YorkshireWater

Thanks to our funders