Mersey Rivers Trust

Healthy rivers for people and wildlife

Mersey Rivers Trust Fisheries Strategy 2021-2050

Mersey Rivers Trust

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Revision and Amendment Register

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1. Introduction

The River Mersey has been subjected to significant pollution for over 200 years, much of which is linked to the industrial revolution resulting in the degradation of many waterways and water dependant habitats. The sources of pollution were linked to both the cotton and chemical industries which were responsible for releasing waste, chemicals, and heavy metals into the river. The impact on the River Mersey was further compounded by agricultural activities and rapid population increases resulting in agricultural pollutants and poor sewage treatment practises elevating the organic waste entering the river. The effect of these pollutants led to a substantial deterioration in water quality and biota with fish reported absent from the River Irwell in the 1850s, and anecdotally, absent from the River Mersey by the 1950s.

In the 1980s the government acknowledged the substantial environmental problems of the Mersey region and began to actively work to improve the water quality of the River Mersey through the establishment of the Mersey Basin Campaign. This resulted in the River Mersey going from arguably one of the most polluted water bodies in the world to a fledgling recovering river system. Following three decades of investment in sewerage infrastructure and sewage treatment facilities exceeding £8 billion, pollution in the River Mersey and its associated tributaries has substantially reduced in recent years. Additional investment is planned to improve water quality further through the current decade and into the 2030s.

This turnaround in water quality of the river has enabled the Mersey fish populations, effectively wiped out through much of the river system, to re-establish themselves in many parts of the catchment. In some cases, recolonisation of the river by fish species has been natural. For instance, headwater fish like trout have emigrated into new territories downstream because of water quality improvements. In others, stocking has allowed some species to gain a foothold, and where conditions exist to complete their lifecycles, to develop self-sustaining populations.

Although dramatic improvements within the River Mersey have occurred, substantial modifications which were made to the river for water supply, power, navigation, flood control and waste disposal are still evident. Examples include the Manchester Ship Canal (MSC), numerous weirs and locks, extensive re-engineering of the river and changes to the natural flow regime. These river modifications continue to hinder fish passage and the availability of good quality river habitat for fish. Water quality in the river is still of concern, including legacy issues such as abandoned waste tips found throughout the catchment and remnants of chemicals used during the industrial revolution still present in the sediments. Diffuse rural pollution remains a key issue to be addressed, Finally, the densely populated urban area through which much of the Mersey River runs creates a variety of inherent challenges, including pollution from road runoff and plastic pollution.

In many areas, fish species are still absent or only sporadically present. In some areas, fish stocking appears to have failed. This is likely due to the river not being able to meet the habitat, food and water quality needs of the various life stages of individual fish species, thus preventing self-sustaining populations from developing.

Much has been achieved in the Mersey Basin but there is much to be done if its fish populations are to regain the diversity and abundance for which they were once renowned. Substantial problems are still present within the river and significant restoration work is still required. Mersey Rivers Trust (MRT) has developed this Fish Strategy to underpin the improvements needed to restore the fish populations across the rivers of the Mersey Basin.

1.1 Historic Fish Populations

The River Mersey and estuary historically supported a diverse and abundant community of fish species. Prior to the industrial revolution, the Mersey was a prolific fishery with records highlighting its importance to the local economy. Trout and salmon were so numerous local apprentices had contracted limits on the weekly inclusion of these fish in their diet. Together with sturgeon, smelt, eels and lamprey, catches from the River Mersey were exported to markets as far as London.

Returning the river to historic levels of diversity and abundance may involve many factors outside the control of the geographical Mersey catchment. For instance, constraints such as climate change, offshore migration, feeding challenges faced by migratory species, and unknown effects of pollutants such as endocrine disrupters and micro/nano plastics are all aspects that cannot be directly influenced/controlled under this Fish Strategy. Within these constraints, our aim is to restore the fish community of the river to maximize the diversity and abundance of fish species in the River Mersey by 2050.

An examination of the literature confirms that a range of fish species were present within the river and estuarine environments prior to the onset of the industrial revolution (Table 1.1). Information sources for the fish species data are provided in the bibliography.

Notably absent from the list in Table 1.1 (below) are sea lamprey (*Petromyzon marinus*), allis shad (*Alosa alosa*) and twaite shad (*Alosa fallax*). Although sea lamprey does not appear in any known historic written records prior to the industrial revolution, it is considered likely they were present due to their current widespread distribution throughout the British Isles and their historic presence in river catchments immediately to the south and north of the Mersey. Shad are also likely to have been present prior to industrialisation, having been historically abundant in other UK rivers.

Although no formal assessment of abundance for the fish community exists in the historical references, comments in various publications prior to and during the industrial revolution refer to abundant fish stocks and vibrant fisheries covering many of these species. In some cases, particularly regarding Atlantic salmon, smelt and European eel, the fisheries were highly regarded and prolific to the extent of being commonplace.

Whilst it is impossible to recreate the habitat conditions that prevailed in the Mersey Basin prior to industrialisation in their entirety, MRT believes that by taking a long-term strategic approach, appropriate habitat restoration within the catchment (both physical and water quality) should allow for most of the species identified above to re-establish self-sustaining, regenerative populations.

It must be noted that both burbot and sturgeon are classified as extinct within British waters and as such a programme of planned reintroductions would be required should there be a desire to have these fish re-colonise the Mersey Basin. However, the abundance of all fish populations mentioned above will be determined by the extent of strategic habitat restoration to accommodate the requirements of the various life stages of each species.

Seeing the return of these species to the Mersey Basin is a core objective of the work of MRT. Once the species are established, further aims will be to maximise the abundance of each, such that self-sustaining, resilient populations are maintained for future generations.

Table 1.1: Fish species noted to occur in the river and estuarine environments of the Mersey Basin prior to the onset of the industrial revolution.

Riverine species	Estuarine species	Migratory species
Bullhead (*Cottus gobio*)	Flounder (*Platichthys flesus*)	European eel (*Anguilla anguilla*)
Stone loach (*Barbatula barbatula*)	Cod (*Gadus morhua*)	River lamprey (*Lampetra fluviatilis*)
Grayling (*Thymallus thymallus*)	Sturgeon (*Acipenser sturio*)	Atlantic salmon (*Salmo salar*)
Dace (*Leuciscus leuciscus*)	Herring (*Clupea harengus*)	Sea trout (*Salmo trutta*)
Minnow (*Phoxinus phoxinus*)	Whiting (*Merlangus merlangus*)	Smelt (*Osmerus eperlanus*)
Chub (*Leuciscus cephalus*)	Small-spotted catshark (*Scyliorhinus canicula*)	
Gudgeon (*Gobio gobio*)	Pilchard (*Sardina pilchardus*)	
Common bream (*Abramis brama*)	Sprat (*Sprattus sprattus*)	
Silver bream (*Abramis bjoerkna*)	Lesser Pipefish (*Syngnathus rostellatus*)	
Roach (*Rutilus rutilus*)	Sand Goby (*Pomatoschistus minutus*)	
Rudd (*Scardinius erythrophthalmus*)	Torpedo ray sp. (*Torpedo* sp.)	
Common carp (*Cyprinus carpio*)	Fivebeard rockling (*Ciliata mustela*)	
Tench (*Tinca tinca*)	Shore rockling (*Gaidropsarus mediterraneus*)	
Perch (*Perca fluviatilis*)	Small cods (*Trisopterus* sp.)	
Three-spined stickleback (*Gasterosteus aculeatus*)	Long-spined sea scorpion (*Taurulus bubalis*)	
Pike (*Esox lucius*)	Pogge (*Agonus cataphractus*)	
Ruffe (*Gymnocephalus cernuus*)	Common sole (*Solea solea*)	
Crucian carp (*Carassius carassius*)	Thick-lipped mullet (*Chelon labrosus*)	
Brook lamprey (*Lampetra planeri*)	Thinlip mullet (*Chelon ramada*)	
Burbot (*Lota lota*)	Common dab (*Limanda limanda*)	
Brown trout (*Salmo trutta*)	European plaice (*Pleuronectes platessa*)	

1.2 Catchments

The Government introduced the Catchment-Based Approach (CaBA) for the management of the water environment across all areas of England to promote integrated water management. Government policy has encouraged the establishment of catchment partnerships throughout

England, bringing local stakeholders together to collectively plan and deliver actions to improve the river environment and engage with local communities about their local rivers. Each CaBA catchment partnership has a catchment "host" to facilitate and drive the activities of the partnership.

The Mersey Basin has been divided into five CaBA catchment partnerships (Figure 1.1 and Figure 1.2), namely:

1. Alt/Crossens hosted by MRT
2. Lower Mersey hosted by MRT
3. Upper Mersey hosted by MRT
4. Irwell hosted by Groundwork Greater Manchester
5. Weaver/Gowy hosted by Groundwork Cheshire, Lancashire and Merseyside.

Of the 23 main rivers within the Mersey Basin, all were achieving Moderate or worse ecological status during the Environment Agency's 2019 Classification under the national Water Framework regulations, whilst all were failing on chemical status (following a change to the assessment methodology from the previous classification period). Of the 13 river systems that had a fisheries assessment conducted, only one achieved Good status, whilst the remaining 12 were variously classified as Bad, Poor or Moderate status.

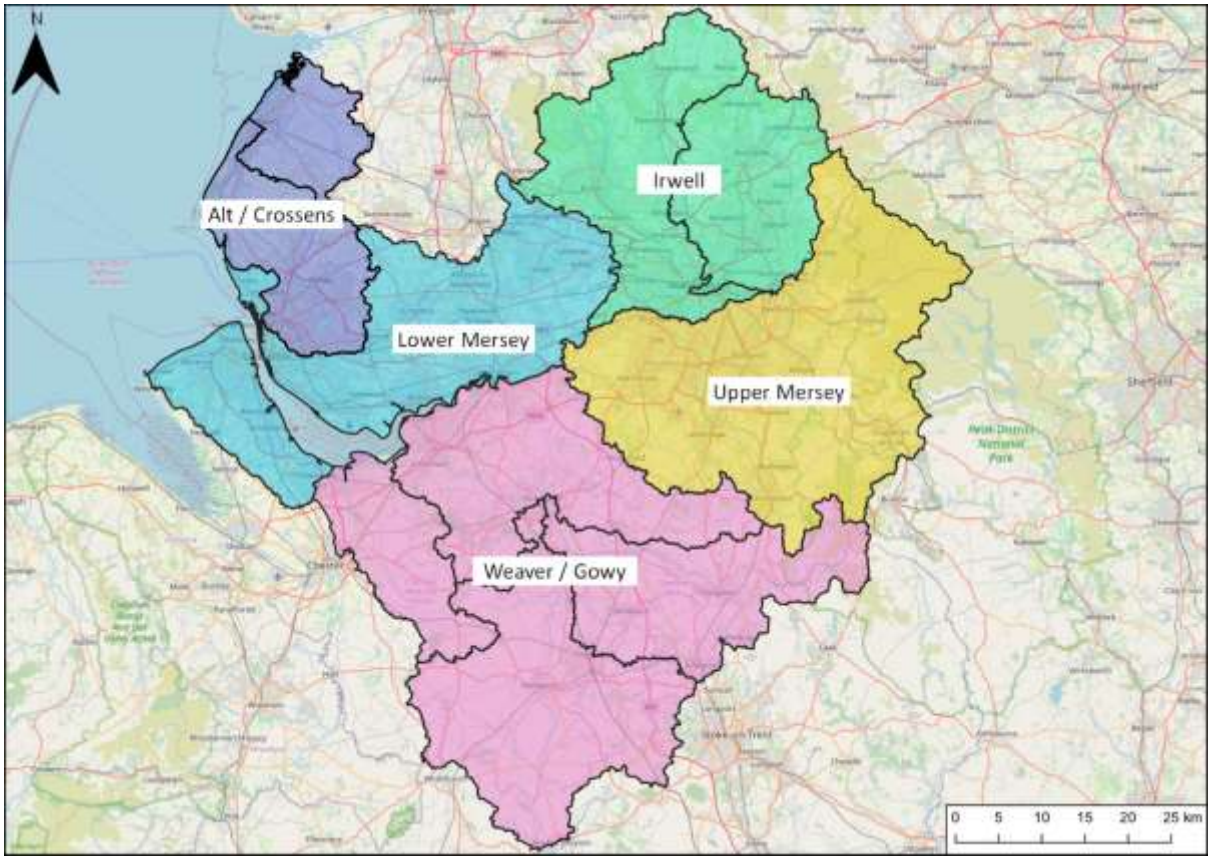

Figure 1.1: Graphical representation of the five CaBA catchment partnerships within the Mersey Basin.

This document focuses on the **Alt/Crossens, Lower Mersey, Upper Mersey and Irwell catchments**. The Weaver-Gowy catchment will be considered in the next phase of the development of MRT's fish strategy and will reported in an updated version of this document.

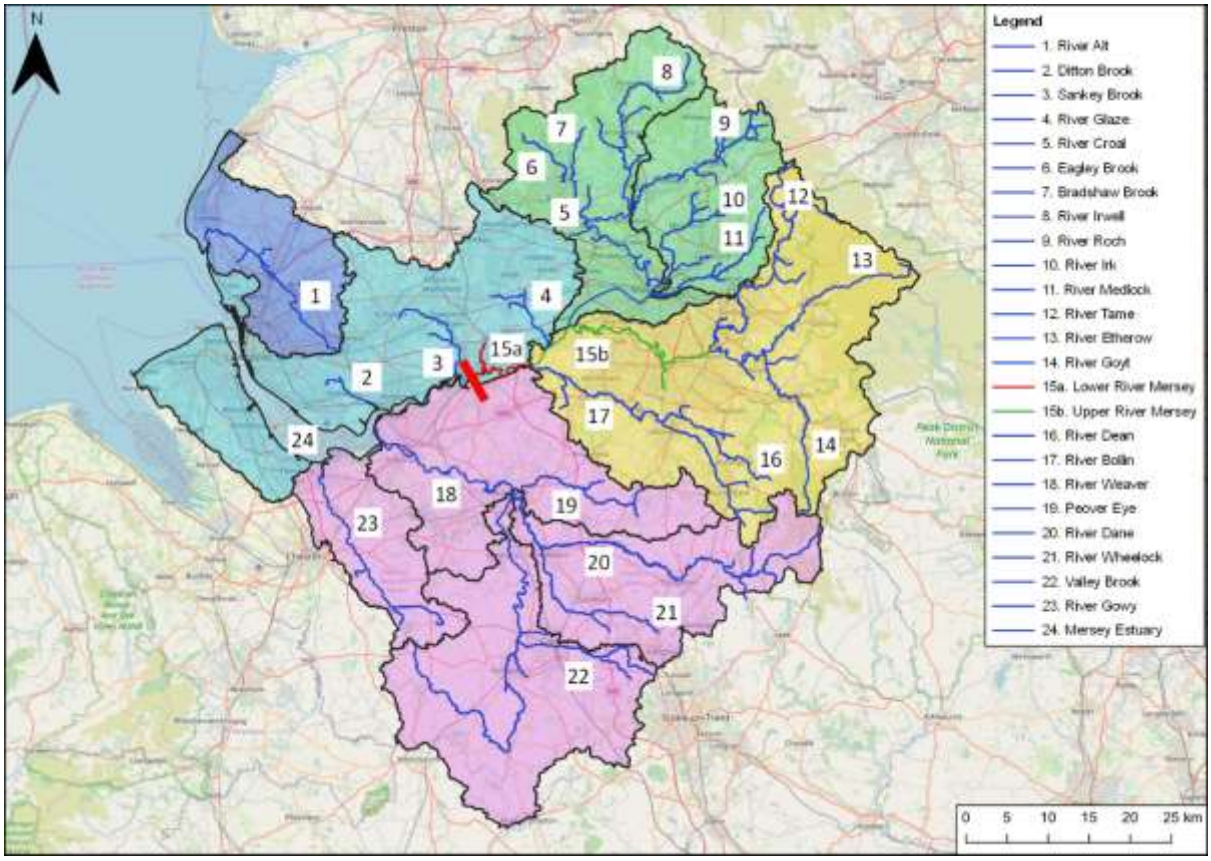

Figure 1.2: Graphical representation of the CaBA Catchments for the Mersey Basin and key river catchment areas. The red line shows the tidal limit of the main stem of the River Mersey.

For each CaBA catchment, we have further sub-divided the catchment into Fisheries Management Catchments (FMCs) as shown in Table 1.2 to enable the development of river-specific strategic targets and actions that recognises the diversity of the rivers in the Mersey Basin but which are integrated into the overall Mersey Basin strategic objectives set out above.

1.2.1 Alt/Crossens Fisheries Management Catchment

The Alt/Crossens Fisheries Management Catchment (Table 1.2) is an area of low-lying land between the Mersey and Ribble Estuaries. Approximately 30% of the catchment is made up of urban areas, including North Liverpool, Formby and Southport along the coast along with Kirkby, Maghull and Ormskirk inland. A large area of the catchment is high grade farmland which is crossed by a series of highly modified watercourses and drains. The water levels are controlled by 13 pumping stations and the catchments drain out into Liverpool Bay and the Ribble Estuary.

1.2.2 Lower Mersey Fisheries Management Catchments

The Lower Mersey covers the lower reaches of the River Mersey and tributaries, along with the Mersey estuary and the inshore waters of Liverpool Bay (Figure 1.1). The Lower Mersey catchment comprises of 50% urban area. The river is therefore faced with a range of urban pollutants such as road runoff, diffuse pollution, and leachate from industrial and/ or contaminated land. The remaining 50% flows through public greenspace and agriculture areas meaning that agricultural pollution also affects the watercourse. None of the Lower River Mersey waterbodies have been assessed as reaching Good classification status. We have

sub-divided the Lower Mersey into the following Fisheries Management Catchments (see also Table 1.2):

- Mersey Estuary
- Ditton Brook
- Sankey Brook
- River Glaze
- Wirral Rivers (to be considered as part of next phase of fish strategy development)

Note that the freshwater River Mersey from the tidal limit at Warrington upstream to the Manchester Ship Canal has been included in the River Mersey Fisheries Management Catchment (see Upper Mersey section and Table 1.2).

1.2.3 Irwell Fisheries Management Catchments

The Irwell drains from the western Pennines and flows through the Pennine Fringe and becomes increasingly more urbanised as it enters the Greater Manchester conurbation prior to flowing into the Manchester Ship Canal in Manchester upstream of Salford Quays (Figure 1.1). This CaBA catchment contains 28 water bodies. In the 2019 Environment Agency classification, none of these water bodies achieved Good status; the majority achieved Moderate status but one water body was classified at Bad status. The main drivers for not achieving Good status include rural and urban diffuse pollution, wastewater discharges and physical barriers causing ecological discontinuity (in particular impacting on fish).

We have sub-divided the Irwell into the following Fisheries Management Catchments (see also Table 1.2):

- River Irwell, Bolton Rivers and Rochdale Rivers
- River Medlock
- River Irk

1.2.4 Upper Mersey Fisheries Management Catchments

This CaBA catchment comprises of the upper reaches of the River Mersey and its tributaries upstream of the Manchester Ship Canal. The River Mersey originates from its source tributaries that rise in the Peak District. The River Mersey is now conventionally considered to be formed where the tributaries of the River Tame and River Goyt meet in Stockport. Further downstream, the River Bollin joins the Mersey after traversing the Manchester Ship Canal at Bollin Point. Approximately 70% of the water bodies within the Upper Mersey CaBA catchment are classified as moderate status (2019 classification), with Good and Poor status water bodies making up the remaining 30%. As expected, Good status water bodies are found in the upland areas to the east of the catchment while the lower classification water bodies are found in the more lower lying urban areas near Manchester and Stockport.

We have sub-divided the Upper Mersey into the following Fisheries Management Catchments (see also Table 1.2):

- River Mersey (including the reach from the Manchester Ship Canal to the tidal limit at Warrington)
- River Tame
- River Bollin.

**Table 1.2: Fisheries Management Catchments:
Alt/Crossens, Lower Mersey, Irwell and Upper Mersey**

CaBA Catchment	Fisheries Management Catchment	River Catchments
Alt/Crossens	Alt/Crossens	River Alt and Crossens System
Lower Mersey	Ditton Brook	Ditton Brook
	Sankey Brook	Sankey Brook
	River Glaze	River Glaze
	Wirral Rivers *	Rivacre Brook, Dibbinsdale Brook, Clatter Brook, The Birket, Arrowe Brook and Fender
	Mersey Estuary	Mersey Estuary - from tidal limit at Warrington to 2 km off Perch Rock
Upper Mersey (and small part of Lower Mersey)	River Mersey	River Mersey (source to tidal limit, including the reach of Manchester Ship Canal between Irlam Locks and Bollin Point)
		River Goyt and tributaries
		River Etherow
	River Tame	River Tame and tributaries
	River Bollin	River Dean
		River Bollin and tributaries
Irwell	River Irwell, Bolton Rivers and Rochdale Rivers	River Croal
		Eagley Brook
		Bradshaw Brook
		River Irwell
		River Roch and tributaries
	River Irk	River Irk and tributaries
	River Medlock	River Medlock and tributaries
Weaver/ Gowy	Upper Weaver *	Upper River Weaver and tributaries*
		Valley Brook and tributaries *
	Lower Weaver *	Lower River Weaver and tributaries *
	River Dane *	River Dane and tributaries *
	River Gowy *	River Gowy and tributaries*
Weaver/ Gowy & Lower Mersey	Manchester Ship Canal (non-freshwater) *	Manchester Ship Canal (non-freshwater section downstream of Latchford Locks)
Irwell, Upper Mersey	Manchester Ship Canal	Manchester Ship Canal (freshwater section from Mode Wheel Locks to Irlam Locks)

** Not included in this document but provided for context*

Additionally, as shown in Table 1.2, this document includes the Manchester Ship Canal Fisheries Management Catchment focused on the freshwater section of the canal from the Mode Wheel Locks to Irlam Locks (the upper freshwater pound of the canal above Mode Wheel Locks is included within the River Irwell, Bolton Rivers and Rochdale Rivers FMC). The remaining downstream section of the Manchester Ship Canal (non-freshwater) downstream of Latchford Locks is saline in nature, being hydrologically managed separately from the freshwater Canal – this part of the canal will be considered as a separate FMC alongside the Weaver-Gowy FMCs and the Wirral Rivers FMC (part of the Lower Mersey catchment) in the next phase of our fish strategy development.

1.3 Actions

MRT's approach for the restoration of fish species diversity and abundance to the Mersey is strategic, incremental and, of necessity, reflecting a long-term, 30-year approach (to 2050) to allow sufficient time to address the scale of the challenge. The first action focuses on information and up-to-date evidence collection. For this action, a five-year programme of investigation, data gathering and analysis has been set. To structure this approach, three areas have been highlighted as requiring immediate further action to kickstart the Mersey Fisheries Strategy which include:

- fish species surveys
- obstruction mapping
- habitat surveys.

1.3.1 Fish species surveys

This section aims to identify what species are present in the Mersey and where within each Fisheries Management Catchment.

The methods selected are those best suited to maximise data collection over the largest possible area given the limited time available. Three methods of data collection are planned for the freshwater FMCs:

a) Electric fishing and fry netting

These survey techniques will be deployed in the appropriate habitat in riverine FMCs (wadable areas for electric fishing and river margins of deeper lowland areas for fry netting). The methodology proposed is known as 'Point Abundance' sampling which is targeted predominantly at juvenile fish. This is a rapid survey technique that can cover approximately 10 to 12 survey sites daily to obtain semi-quantitative data on fish presence and abundance over large areas. Specific survey methods for the Mersey Estuary and Manchester Ship Canal FMC will also be developed in dialogue with other catchment stakeholders, including the Manchester Ship Canal Company, Mersey Gateway Environmental Trust and Environment Agency.

b) Anglers' match and logbook catch data

By organising angling matches in a controlled manner, semi-quantitative angling data can be collected from lowland river locations, providing information on adult fish assuming the fishing effort is appropriately high. This information can provide species presence/absence and

growth analysis to obtain vital information on recruitment. In addition, anglers (game and coarse) will be encouraged to participate in an angler's logbook scheme including mid and upper river reaches. Anglers will be asked to record catches and effort across the River Mersey system. Incentives such as prizes can be offered to encourage participation, particularly on those rivers where fishing is considered sub-standard.

c) eDNA analysis

eDNA metabarcoding analysis is a relatively new fish survey methodology which can characterise fish species diversity from water samples. This method is normally reserved for lentic systems but can be applied to riverine and estuarine systems to identify the fish species assemblage up to 2 km upstream. Furthermore, where representative water samples are taken above and below a barrier, the results can inform the potential passability of the barrier if species assemblage is found to differ between the samples.

To effectively monitor the fish species throughout the Mersey Basin catchment, strategic locations will be sampled using eDNA above the confluences of tributaries (red circles in Figure 1.3). This will provide an overview of the species inhabiting each watercourse and, where a difference in assemblage occurs, could highlight where further management interventions are required. Furthermore, following on from the obstruction mapping exercise, where significant barriers are identified, the passability of each can be semi-quantified using eDNA techniques. Here, water samples can be collected above and below each structure (blue and green circles in Figure 1.3, respectively), and as before, the difference in assemblage could highlight impassability. We will work with other partners who are carrying out eDNA fish survey and analysis in the Mersey Basin to develop the sampling strategy.

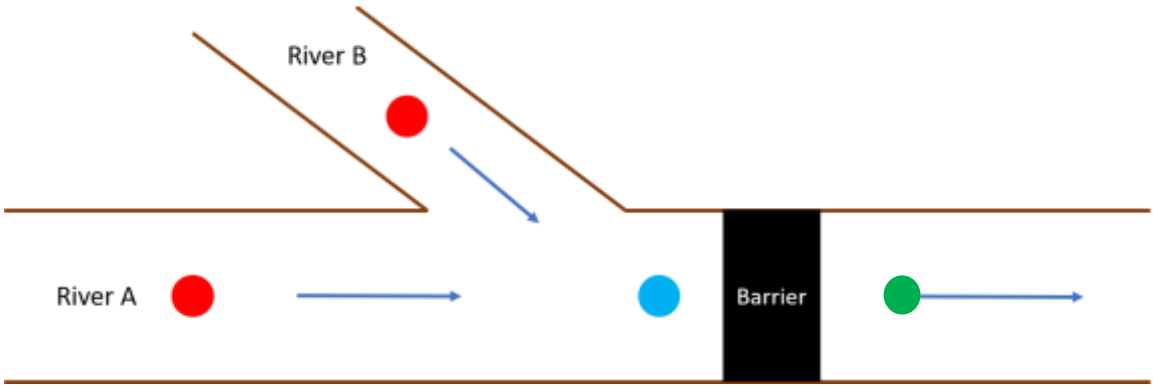

Figure 1.3: eDNA schematic for river fisheries monitoring (red circles) and barrier assessments (blue and green circles). Blue arrows represent the direction of flow. NB: not to scale.

1.3.2 Obstruction Mapping

Despite recent efforts, there is still a lack of enough detailed information on man-made obstructions to fish movement throughout the catchment caused by the construction of weirs, locks and a wide range of other structures. A detailed understanding of the obstacles is imperative to understand the connectivity of the Mersey Basin as a whole (e.g. the impact of the Manchester Ship Canal) and the access to minor tributaries in the various sub-catchments (as identified above).

The assessment of obstacles to migration needs to consider the requirements of all species which currently inhabit the river and those which have historically inhabited the Mersey (see Table 1.1 earlier) to achieve the goal of increasing fish species richness to pre-industrial revolution levels. This includes both diadromous (migratory) and potamodromous (riverine) species as the requirements for both will differ. These requirements differ owing to both the swimming and leaping abilities which for example, are notably greater in salmonids as opposed to coarse fish. To ensure obstructions do not impede the free passage of fish and thus impact self-sustaining populations for all species within each sub-catchment, a detailed inventory of all barriers to fish movement under low flows is required.

A concerted effort has already begun collecting detailed data on the obstructions in the Mersey catchment, particularly by the Irwell CaBA partnership, but many catchments still require obstruction surveys. Working with catchment partners, MRT will ensure full coverage of the Mersey Basin is achieved within the next three years (subject to funding), and that all obstruction data are held and maintained in a freely available form. Combining this information with fish presence/absence and habitat data in a strategic manner will enable the long-term fish community objectives for the Mersey Basin to be realised.

1.3.3 Habitat Surveys

As with obstructions, there have been several attempts to map fish habitat in the catchment, with some catchments such as the River Bollin being surveyed several times. However, access to this information to facilitate strategic decision making is generally limited and survey data becomes outdated after a period of time, particularly if a major flood event has occurred since the last survey. Appropriate fish habitat assessments are required for all the Fisheries Management Catchments identified above. This information can be linked with the species presence/absence data and obstruction mapping data to allow the development of meaningful habitat restoration strategies.

Habitat data collection is time-consuming and costly. Ensuring accessibility via GIS is essential to allow effective use of the data to promote the most appropriate habitat restoration schemes. To undertake this work effectively across the entire Mersey catchment, a five-year programme is proposed. The objective is to produce a detailed GIS-based habitat inventory of the Mersey Basin highlighting areas of degradation to facilitate strategic targeting of habitat restoration actions. We will work with catchment partners to identify any recent fish habitat survey data that may be available in GIS format that can be utilised to reduce the scale of primary surveys that will otherwise be required.

Only by combining these three types of information (fish species, obstructions, and habitat) can informed and appropriate habitat restoration schemes be developed to meet the long-term objectives.

1.4 Timeline

Due to the lack of contemporary data, it is proposed to preliminarily focus on both the fish and obstruction surveys over the next three years, with habitat mapping being backloaded into the programme to ensure resources are not over stretched. Additionally, habitat surveys have been staggered a year behind the fish and obstruction surveys so that their results can inform potential priority areas to focus efforts, enabling future programme efficiencies. Where data on obstructions or habitat already exists, earlier integration of that information can be

undertaken to move forward with habitat and access improvements as the survey work identified above progresses.

Table 1.3 outlines the proposed programme timeline. Each activity has been split by seasonality to account for optimal survey conditions with a rationale for each explained below:

- Fish species surveys – planned for both spring (electric fishing) and autumn (fry netting) to account for suitable underfoot conditions and adequate juvenile development, respectively. NB: eDNA surveys and angler matches/logbooks can run concurrently each year assuming suitable river conditions are available for eDNA surveys and fishing closed seasons are adhered to.
- Obstruction mapping – planned for summer to account for low flows where the obstructions will represent the greatest level of impact to fish passage.
- Habitat surveys – planned for spring and summer owing to both suitable conditions (lower flows, improved clarity and macrophyte growth) and the time requirements to adequately map the riverine areas.

Table 1.3: Gannt chart of proposed timeline for obstruction mapping (blue), fish surveys (orange = electric fishing & yellow = fry netting) and habitat surveys (green) split by season over the next five years. Angling matches/surveys will adhere to the permitted seasons for the target species and eDNA sampling can occur throughout the periods when flows are appropriate and target species present (e.g. Atlantic Salmon)

Fisheries Management Catchment or River Catchment	Year 1				Year 2				Year 3				Year 4				Year 5			
	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut
Alt/Crossens																				
R. Irwell and Bolton Rivers																				
Rochdale Rivers																				
River Irk																				
River Medlock																				
River Tame																				
R. Etherow & R. Goyt																				
River Mersey																				
River Bollin																				
Manchester Ship Canal																				
River Glaze																				
Sankey Brook																				
Ditton Brook																				
Mersey Estuary																				

2. ALT/CROSSENS FMC

2.1 Fisheries Management Catchment Summary and Tributaries

The River Alt is a tributary of the Mersey Estuary. It is a lowland river and runs through heavily urbanised areas for a substantial part of its length, running underground in culverts for hundreds of metres at several points in the upper reaches. The river flows across built up areas in Merseyside, from its source in Huyton at Hag Plantation, moving northeast through Croxteth Park, West Derby and Maghull. In its lower reaches the Alt meanders across a lowland agriculture plain for a large part of its length (10 km) before entering the Mersey Estuary, between Crosby and Formby. It is 36 km in length overall, draining a catchment area of approximately 103 km^2.

The River Alt has suffered historically from pollution from industry and sewage in its upper urban areas and run-off from farmland in its lower reaches. In the Environment Agency's 2019 classification, the river is failing to achieve Good status or higher for several elements, including phosphate and dissolved oxygen, with physical modifications and point source pollution listed as the main Reasons for Not Achieving Good status (RNAG). Overall, the River Alt was classified in 2019 as achieving Moderate ecological status but failing on chemical status.

Tributary streams of the River Alt include the following and are displayed in Figure 2.1:

- Maghull Brook
- Hunt's Brook
- Dover's Brook
- Moor Hey Brook
- Downholland Brook
- Downholland (Lydiate/Cheshires Lines) Brook
- Chisnall Brook
- Simonswood Brook
- Tue Brook
- Croxteth/Knowsley Brook.

2.2 Current fish population

Recent fisheries data for the Alt/Crossens FMC is lacking with no monitoring data available from the EA's fish survey datasets in the past five years. However, stocking exercises by the EA were completed in 2016 to boost coarse fish stocks with 9,000 mixed coarse species (chub, dace and roach) being introduced into the River Alt. The only contemporary data available on the fish assemblage are from some limited angler catch data since 2015 (Table 2.1).

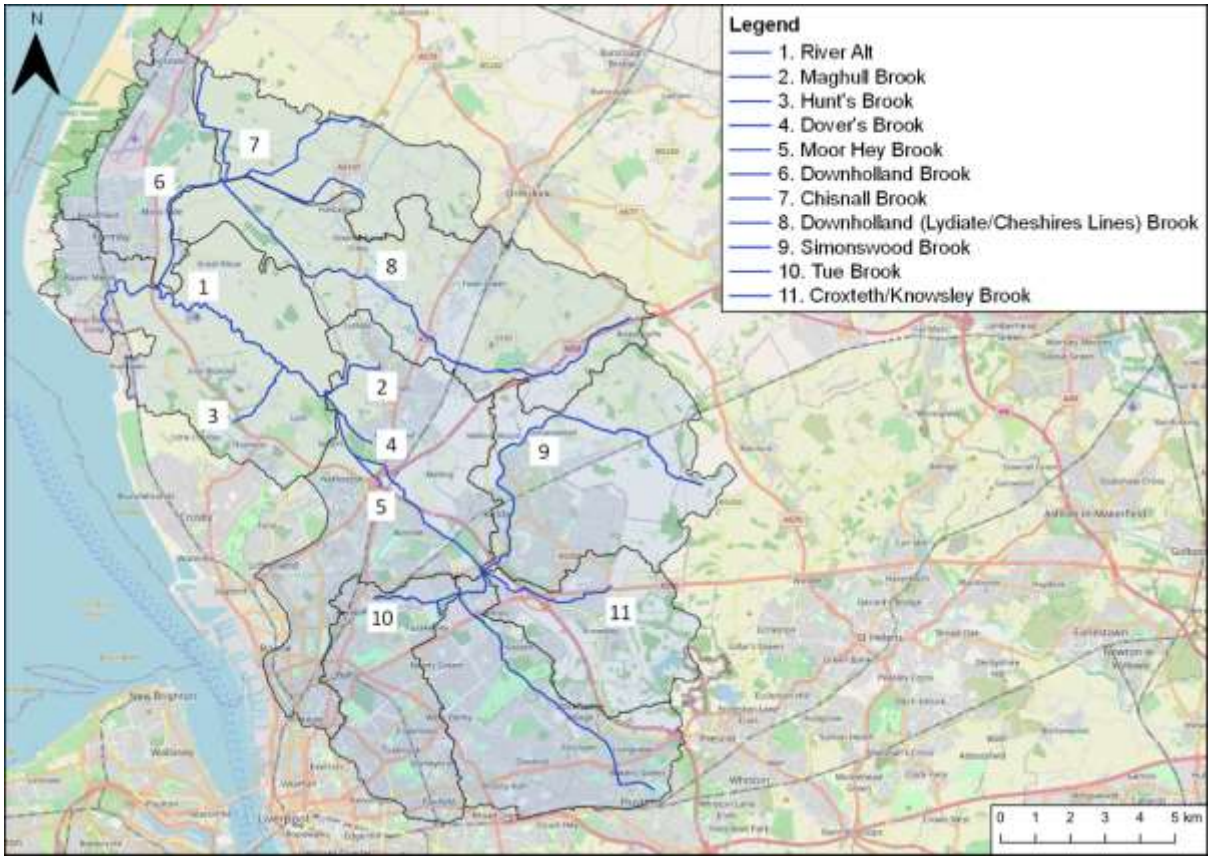

Figure 2.1: River Alt catchment watercourses.

From the small recent dataset available, the current fish population in the River Alt appears to be limited with poor species richness (n = 7) compared to what might be anticipated from other tributaries within the wider Mersey Basin. This may, however, be down to a lack of survey data, and therefore the immediate requirements are for more information on the presence and status of fish populations in the River Alt.

Table 2.1: Angler catch data from the Alt/Crossens FMC.

Caught species
Common bream
Brown trout
Chub
Flounder
Pike
Roach
Three-spined stickleback

2.3 Fish population objectives

Monitoring will undoubtedly reveal other species, but the following provides a provisional list of the additional species that should be able to colonise in the Alt/Crossens in the future, assuming water quality, habitat and fish access are suitable.

Table 2.2: Additional species likely to be able to colonise the Alt/Crossens FMC in future, assuming habitat and water quality requirements are met.

Riverine species	Migratory species
Grayling	Atlantic salmon
Perch	European eel
Barbel	Sea lamprey
Dace	River lamprey
Gudgeon	
Bullhead	
Common carp	
Stone loach	

The objectives for the Alt/Crossens FMC are therefore:

1. Establish the status of coarse fish and trout recruitment, including the distribution and abundance of juvenile stages;
2. Establish the status of migratory species including Atlantic salmon, eel and lamprey species; and,
3. Evaluate fish habitat for salmonid and coarse fish life stages.

2.4 Immediate Actions

To meet the objectives proposed, immediate actions for the Alt/Crossens FMC are required. These are:

1. Fisheries surveys – These will be completed using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers' match/logbook records and eDNA sampling above and below major obstructions and tributary streams.
2. Obstacles and Habitat mapping – Little is known about the physical habitat and characteristics of the Alt/Crossens FMC; therefore, the following obstacle and habitat mapping has been proposed:
    a. Identify and assess passability of obstructions during low flows of both diadromous and potamodromous species;
    b. Coarse fish and salmonid spawning habitat availability, distribution, and quality; and,
    c. Coarse fish and salmonid juvenile habitat availability, distribution, and quality.

3. RIVER BOLLIN FMC

3.1 Fisheries Management Catchment Summary and Tributaries

The River Bollin begins on the edges of the Peak District around Macclesfield Forest and in total is 68 km in length with a catchment area of 273 km^2. A major tributary is the River Dean which joins the Bollin about 10 km from its source, just above Styal Mill. The River Bollin is culverted underneath the Manchester Airport runways for several hundred metres, eventually flowing into the River Mersey after crossing the Manchester Ship Canal at Bollin Point. There are no physical obstructions here, but periodic water quality deterioration may act as a chemical barrier impeding fish movement across the canal.

Tributary streams of the Rivers Bollin FMC are identified in Figure 3.1.

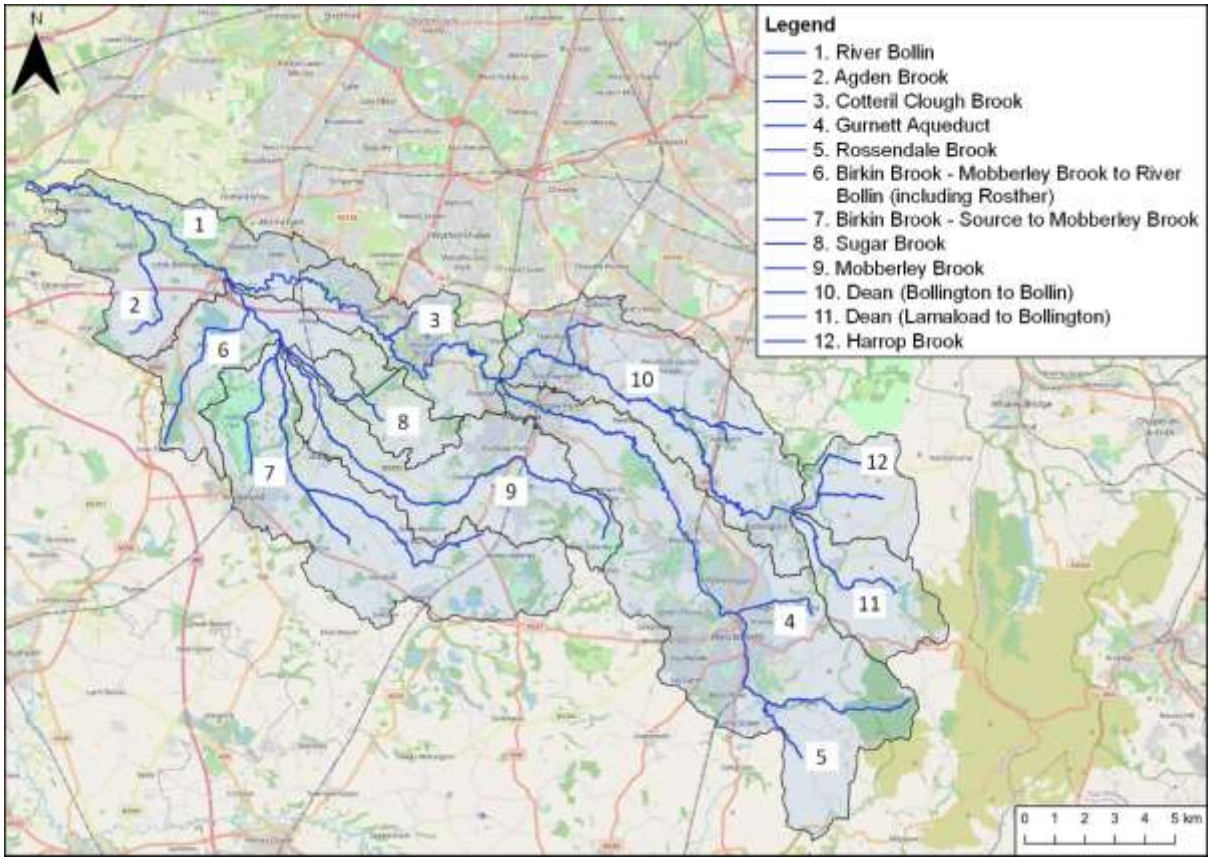

Figure 3.1: River Bollin FMC and associated watercourses.

Anecdotally, substantial improvements in water quality have been seen over the pre-2000 levels with Biochemical Oxygen Demand (BOD) remaining relatively stable for the past two decades with levels typically ranging between 2.4 – 2.6 mg/L (Figure 3.2). Given that pristine, unpolluted rivers usually have BOD levels below 1 mg/L and the recommended threshold to accommodate salmonids is < 3 mg/L, the river is now regarded as suitable for both salmonids and coarse fish species.

Ammonia in water mainly originates from domestic sewage effluent and agricultural run-off and can cause tissue and gill damage to fish at high levels. The relationship between ammonia

and its impact on fish is not straightforward with the level of toxicity being dependent upon the concentration of un-ionised ammonia (NH_3), which itself increases with both pH and temperature. However, Imperative Standards historically set in the EU Freshwater Fish Directive concluded that levels of total ammonium should not exceed 1 mg/L for both salmonids and cyprinids with guidelines standards set at 0.04 and 0.2 mg/L, respectively. Therefore, as the total ammonia levels are relatively low ranging between 0.14 – 0.36 mg/L (Figure 3.3), the River Bollin FMC is suitable for both cyprinids and salmonids but could be improved to meet the guideline standards.

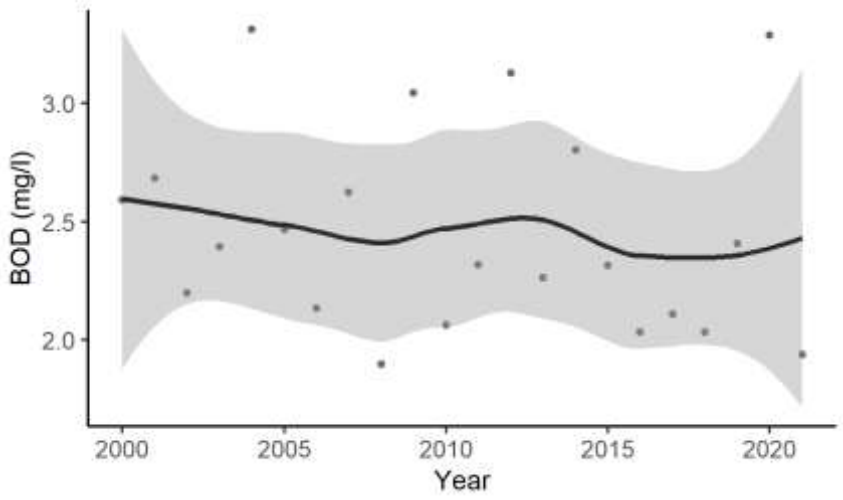

Figure 3.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Bollin FMC between 2000 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

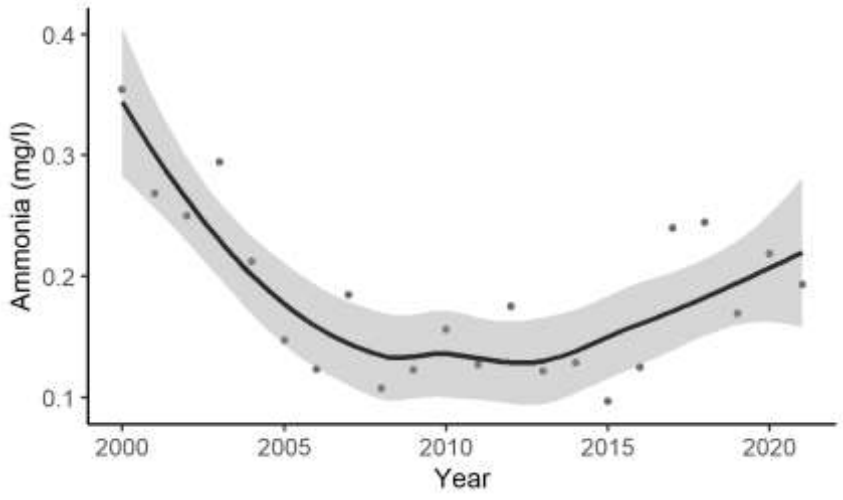

Figure 3.3: Ammonia across the River Bollin FMC in mg/L between 2000 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

3.2 Current Fish Population Status

Recent records of the fish assemblage within the River Bollin catchment exist from EA monitoring data, angler catch records and consultancy-led ecological reports. These show that the River Bollin has a species richness of 13 with several notable species (Table 3.1).

Table 3.1: Fish species identified within the River Bollin FMC between 2015 – 2020.

Riverine species	Migratory species
Bullhead	European eel
Stone loach	European river lamprey
Grayling	Sea trout
Brown trout	
Minnow	
Chub	
Gudgeon	
Roach	
Perch	
Three-spined stickleback	
Brook lamprey	
Roach	
Dace	
Barbel	
Pike	

From anglers' records, brown trout and bullhead are considered abundant in the upper reaches but are only seen occasionally or noted as present elsewhere in the catchment. Stocking records available show that between 1995 and 2009 the Bollin/Dean system received numerous coarse fish stockings which included the following species: barbel, common bream, chub, dace, gudgeon, perch, roach and brown trout.

Atlantic salmon juveniles are notably absent, although adult salmon jumping at weirs in the Bollin have been reported for many years but they are not present in the 2015-20 datasets. Adult salmon have also been sighted upstream of Styal Mill following the installation of a new fish pass. There is no recent evidence of juvenile salmon from the catchment potentially suggesting that adult salmon are unable to reach suitable spawning habitat. In addition to salmon, common bream, tench and common carp would also be expected in the lower Bollin.

3.3 Fish Population Objectives

The long-term objectives for the River Bollin FMC are to provide sustainable and abundant populations of both the existing species observed in the past five years and those that have been identified as absent but expected to be present with adequate water quality and habitat. The additional species expected for the River Bollin sub-catchment are outlined in Table 3.2 below.

Table 3.2: Additional species anticipated to be present in the River Bollin FMC following the completion of the long-term water quality and habitat objectives.

Riverine species	Migratory species
Common bream	Atlantic salmon
Tench	Sea lamprey
Common carp	

It is not expected that all species will be found in all reaches of the River Bollin FMC. Given free movement following actions to address migration obstructions, fish species will be expected to distribute/naturally disperse to appropriate habitat. For example, juvenile salmonids might be found in the shallow, fast flowing upper and middle reaches predominantly, whereas common bream, tench and common carp might only be seen in the deeper, slow flowing lower reaches towards the lowest reaches of the river. Other species like eel and lamprey species might be found throughout the river system.

The initial objective for 2025 is to establish the presence/absence and life stage analysis of the anticipated species and identify the constraints to establishing those species identified above as absent. The MRT long-term objective is to overcome those constraints, whether driven by water quality, obstructions and/ or habitat, once identified. This should remove the bottlenecks to provide stable, sustainable, and abundant diverse fish populations in the Bollin FMC.

Known constraints with the catchment include:

1. Heavy siltation from land use and/ or highway run-off causing extensive habitat damage.
2. Obstructions to migration upstream of Wilmslow.
3. Episodic water quality deterioration at the confluence with the Manchester Ship Canal affecting migration upstream and downstream of all species.

3.4 Immediate Actions

The immediate requirement is to address the lack of data on fish populations throughout the Bollin FMC. The objective is to establish the species presence and allow an initial assessment of constraints to allow interventions to be developed.

1. Fish Survey: FMC-wide using point abundance semi quantitative techniques including electric fishing and fry netting, anglers' match and logbook catch records. eDNA sampling should be undertaken above and below major obstructions and tributary streams.

2. Obstacles & Habitat mapping: Full catchment surveys on obstacles and fish habitat have been undertaken on at least two occasions in the past 20 years. These surveys should be obtained and where necessary augmented and/ or repeated to provide up-to-date information on the obstructions, habitat availability and degradation.

4. RIVER MERSEY FMC

4.1 Fisheries Management Catchment Summary and Tributaries

The River Mersey FMC covers the extends upstream from the tidal limit at Howley Weir in Warrington to the headwaters of the Rivers Goyt and Etherow (Figure 4.1). It also includes the short section of the Manchester Ship Canal from where the River Mersey enters the canal below Irlam Locks and downstream to Bollin Point where the River Mersey leaves the canal. The River Tame, a major tributary of the River Mersey, is considered as a distinct FMC primarily due to its size and water quality differences to the Etherow and Goyt river systems.

The Mersey FMC is roughly 135 km in length, with the Rivers Goyt and Etherow comprising 49 km and 57 km, respectively. The catchment area of the Mersey FMC is approximately 1,006 km^2. The Etherow and Goyt are characteristically fast flowing and upland in nature in their upper reaches, before becoming slower as the rivers merge upon entering Stockport.

In the headwaters, the River Goyt rises on the moors of Axe Edge near the Cat and Fiddle Inn and flows in a northerly direction through Whaley Bridge, New Mills and Marple before becoming the Mersey at the confluence with the River Tame in Stockport. The River Etherow rises on Pikenaze Moor in Derbyshire where it flows into the Longdendale chain of reservoirs before emerging again at Tintwistle downstream of Bottoms Reservoir dam. The Etherow then flows through Tameside at Hollingworth, passing into Stockport through Etherow Country Park and joining the River Goyt near Marple. There are several major obstructions in the system, notably the substantial weir on the Etherow in Etherow Country Park before the confluence with the River Goyt.

As the River Mersey flow downstream of the Goyt/Tame confluence in Stockport, it passes through Parrs Wood, Fletcher Moss and Chorlton and the river gradually becomes lowland in nature with the main river channel heavily modified for flood control purposes. A series of small tributary streams flow into the River Mersey before it enters the Manchester Ship Canal below Irlam Locks in Carrington, where the Mersey becomes a partially impounded river with the flow regime being more akin to a canal. Although the Manchester Ship Canal continues westward for a further 3 km to Latchford Locks, this is a “blind ending arm” of the freshwater section of the canal, with no freshwater flow normally passing through Latchford Locks. Hence the freshwater flow is out to the River Mersey at Bollin Point. A more natural, deep and meandering lowland river form is encountered once the River Mersey leaves the canal at Bollin Point and flows downstream to the tidal limit at Howley Weir.

There are several weirs in the River Mersey and it is culverted beneath the Mersey Way Shopping Centre in Stockport. Where the River Mersey enters the Manchester Ship Canal at Irlam, the weir is likely to cause an obstruction to fish movements under low flows, but is considered passable, certainly to salmonids, at higher flows.

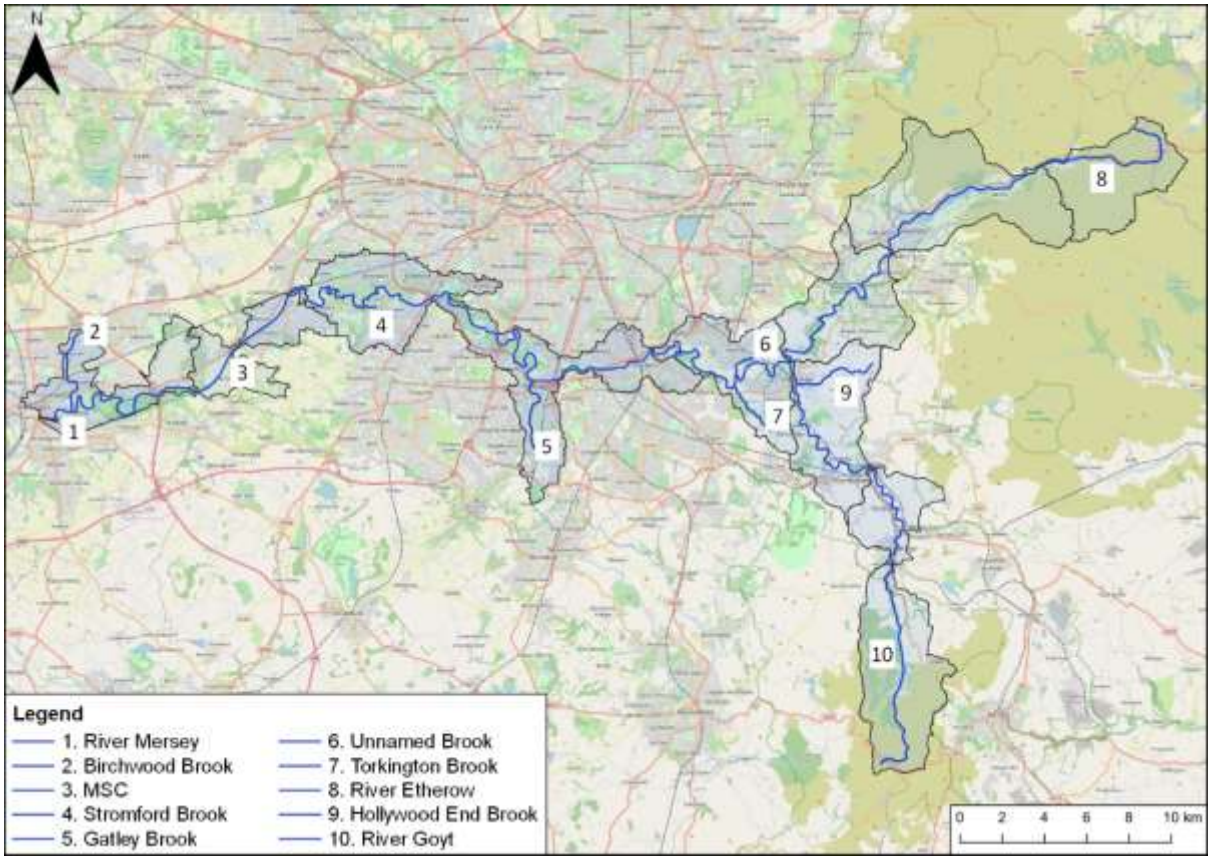

Figure 4.1: River Mersey FMC and key watercourses.

The tidal limit of the River Mersey is located at Howley weir which, outside of spring tides where the structure is drowned, represents a barrier to fish migration. This has been highlighted in the Mersey Gateway Environmental Trust monitoring of migratory salmonids at Woolston weir (6 km upstream of Howley Weir) where both Atlantic salmon and sea trout are frequently recorded following spring tides.

Water quality in the River Mersey has improved substantially since the 1970s; indeed it is in the river reach immediately below Stockport Town Centre that juvenile salmon were first recorded in 2006. This indicates that water quality was of a sufficiently high standard to allow successful completion of at least part of the life cycle for Atlantic salmon in the River Mersey. This is supported by the BOD records (2000 – 2021) which show a low and stable trend of BOD ranging between 2.0 – 2.8 mg/L (Figure 4.2). In addition, total ammonia levels within the same period have fallen from 0.75 mg/L to 0.4 mg/L (Figure 4.3). These BOD and ammonia levels make the River Mersey suitable for both cyprinid and salmonid populations.

There are no records of juvenile salmon presence since 2008, although adults are frequently seen throughout the River Mersey. The latter observations are important as they indicate that adult fish must have travelled through the Manchester Ship Canal from Bollin Point up to Irlam Locks and traversing the weir immediately downstream of Irlam Locks to continue their ascent along the River Mersey. Hence water quality at the time of entry and travel through the Manchester Ship Canal reach must be of sufficiently good quality to allow the passage of salmon for some 7 km for at least some parts of the year.

There are concerns however, about periodic water quality deterioration within the Manchester Ship Canal between Irlam locks and Bollin Point (as well as within the “dead end” section of

the freshwater canal from Bollin Point downstream to Latchford Locks). Due to the physical structure of the canal, being deep and slow flowing, stagnation can occur with a corresponding effect on oxygen levels. Low oxygen during the low flow, warmer months can have a serious effect on fish welfare and act as a barrier to fish movement. This may have a detrimental effect on smolt migration downstream, which typically takes place in May.

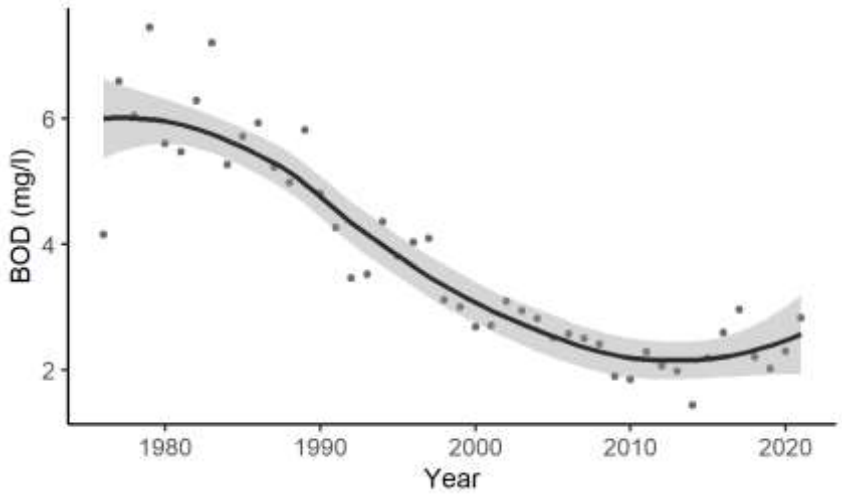

Figure 4.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Mersey FMC between 1976 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

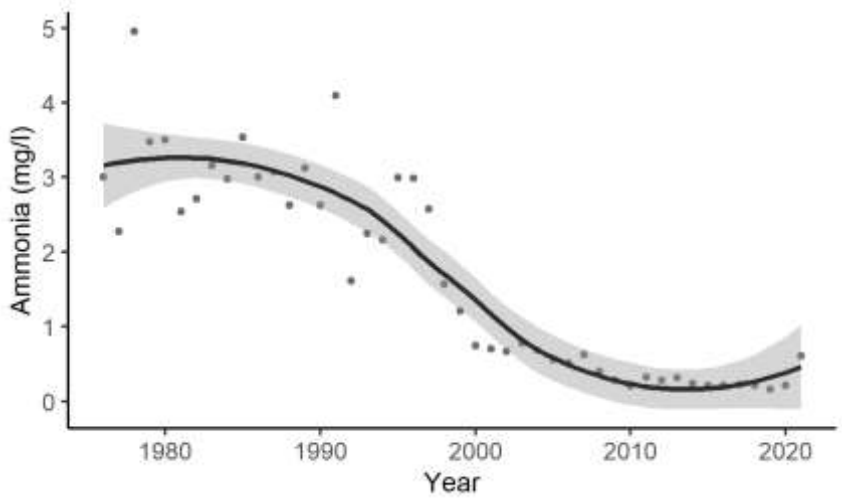

Figure 4.3: Ammonia across the River Mersey FMC in mg/L between 1976 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

4.2 Current Fish Population Status

A range of species have been recorded through the EA's routine fish monitoring programme, angling catch returns and from eDNA analysis (Table 4.1). These datasets have shown that the River Mersey has a species richness of 19 with several notable species.

Table 4.1: List of species observed in the River Mersey between 2015 and 2020.

Riverine species	Migratory species
Barbel	Atlantic salmon
Common bream	Sea trout
Bullhead	European eel
Brown trout	
Common carp	
Chub	
Dace	
Grayling	
Gudgeon	
Minnow	
Perch	
Pike	
Roach	
Stone loach	
Three-spined stickleback	
Brook lamprey	

Available stocking records show that between 2000 and 2017, dace, barbel, perch, roach, chub, brown trout and grayling have been stocked into the River Mersey FMC. All appear in angler catch records in varying numbers, including dace in the lower River Etherow.

The fish species in the River Mersey are broadly in line with what would be expected and appear to be distributed across the three main river systems. Rudd, ruffe and tench species might be expected in slower flowing lower reaches but generally the fish population appears diverse throughout. Data on abundance, however, is limited, and crucially for juvenile stages. Hence survey effort is required to establish the population status of these species and to determine recruitment success.

This is particularly important for Atlantic salmon. Salmon that initially recolonised the River Mersey are thought to have mainly come from rivers in the Solway and other river systems of north-west England (e.g. Ribble, Lune). Juveniles were recorded prior to 2010 in the River Mersey downstream of Stockport but are not believed to have been recorded since. Adult salmon, however, have been recorded by anglers throughout the system, albeit occasionally, as well as at the fish trap at Woolston Weir upstream of the tidal limit in Warrington.

Hence it is important to determine whether a true 'Mersey' Atlantic salmon population has been established or whether we are seeing an annually repeated run of stray fish entering the Mersey system. Furthermore, whilst we have evidence of juvenile salmon, albeit from over a decade ago, we do not know whether smolts successfully negotiated the Manchester Ship Canal on their downstream journey out to sea.

Dedicated juvenile salmon monitoring will provide answers to this important question for the environmental health of the Mersey. Some form of smolt monitoring or juvenile tagging and adult recapture is however, likely to be required in the future to understand whether smolt migration is being successfully completed and returning adults are from a self-sustaining Mersey population rather than strays from other river systems.

In contrast to the main river, species status in the tributaries of the River Mersey downstream of the Tame confluence is less clear, a paucity of data limiting understanding. In Micker Brook for example, the only recent fish record is for the presence of bullhead in 2013. No data are available in the EA datasets for Chorlton Brook. It is important to establish fish species presence/absence as a first step to understanding the recovery status of these tributaries.

4.3 Fish Population Objectives

The long-term objectives for the River Mersey FMC are to provide sustainable and abundant populations of the existing species observed in the past five years throughout the management catchment where habitat is suitable. Not all species will be anticipated to be found in all reaches of the river, but given free movement by addressing obstructions, fish species would be expected to distribute/naturally disperse through the catchment area where habitat is appropriate.

The initial objective for 2025 is to establish a population condition assessment of the species observed in the Mersey FMC and identify any constraints to the various fish life stages. The MRT long-term objective is to overcome those constraints, whether driven by water quality, obstructions and/or habitat, once identified. This should remove the bottlenecks to provide stable, sustainable, and abundant diverse fish populations in the Mersey FMC.

Known constraints within the catchment include:

1. Obstructions to migration on the River Etherow.
2. Low flow obstructions to fish movement in the River Mersey where it meets the Manchester Ship Canal, and where if flows in a culvert under Stockport Town Centre.
3. Effects of urban run-off and siltation on water quality and siltation of riverbed substrates negatively impacting upon fish and fish food organism habitats.

4.4 Immediate Actions

The immediate requirement is to address the lack of data on fish species abundance and distribution throughout the FMC. The presence/absence of juvenile stages of Atlantic salmon and coarse fish species previously stocked is also of particular concern. The objective is to confirm species presence using a variety of survey techniques and provide data on relative abundance, spawning success and recruitment to allow an initial assessment of constraints, and to allow interventions to be developed.

1. Fish Surveys: catchment-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers' match and logbook catch records and eDNA sampling above and below major obstructions and tributary streams, particularly Micker Brook and Chorlton Brook.
2. Obstacles & Habitat mapping: Habitat data are required for the River Mersey FMC including information on:

a. obstructions during high and low flows to coarse fish and migratory salmonids;
b. habitat quality for coarse fish and salmonid adults;
c. coarse fish and salmonid spawning habitat availability, distribution, and quality; and,
d. coarse fish and salmonid juvenile habitat availability, distribution, and quality.

5. RIVER TAME FMC

5.1 Fisheries Management Catchment Summary and Tributaries

The source of the River Tame is on Denshaw Moor on the Western Pennines close to the West Yorkshire border. In total, the River Tame extends over approximately 69 km from its source to its confluence with the River Goyt / River Mersey. The river effectively begins as the compensation flow release from Readycon Dean Reservoir, flowing southwards through Delph, Stalybridge, Ashton-Under-Lyne, Dukinfield, Denton and Hyde. It joins the River Goyt in Stockport Town Centre next to the M60 to form the River Mersey (Figure 5.1).

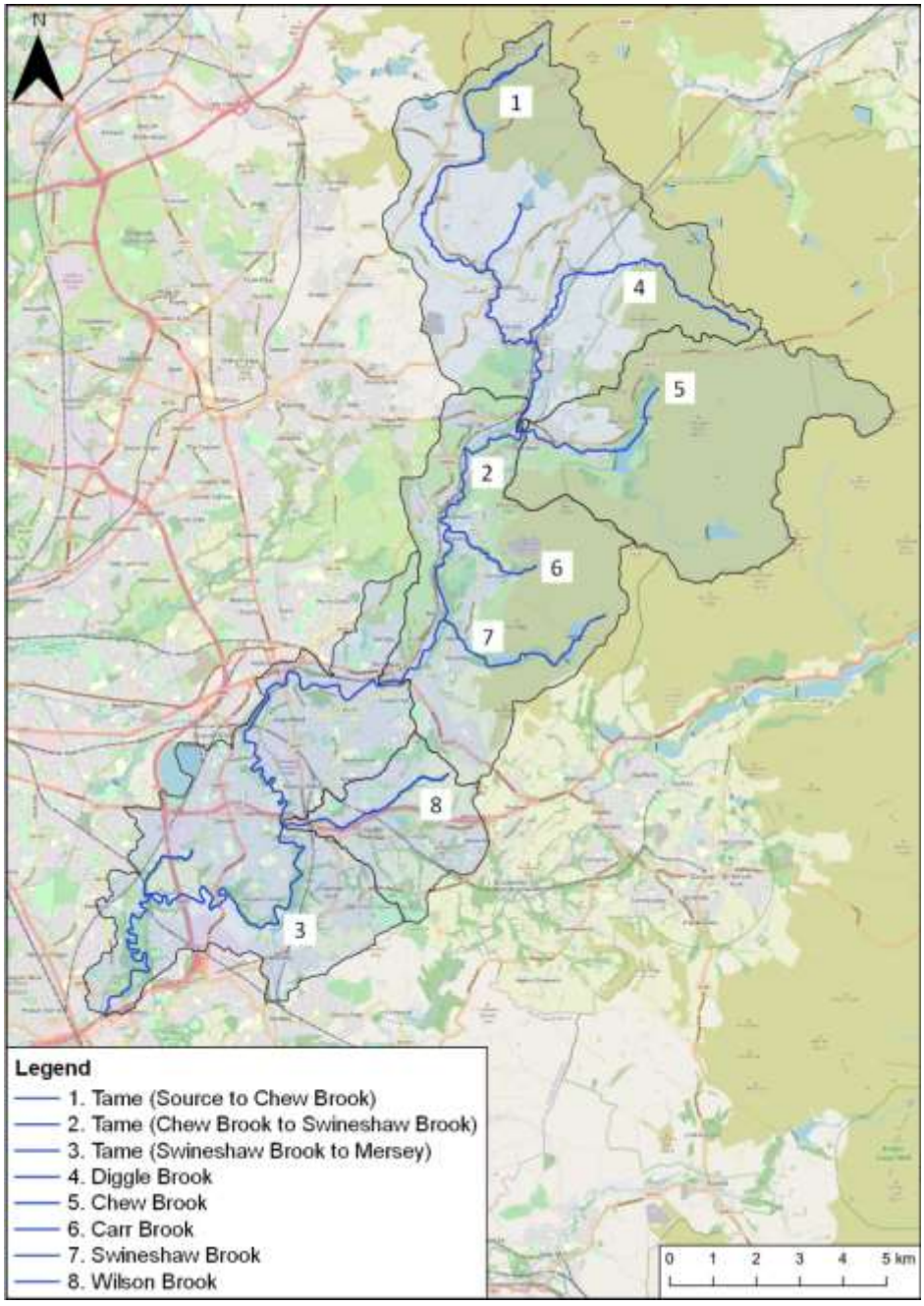

Figure 5.1: River Tame FMC and its associated watercourses.

Despite its moorland origins, the River Tame flows through an increasingly urban landscape once it passes Stalybridge, but with notable green space shouldering the banks through Newton Wood, north of Bredbury Industrial Park and Reddish Vale Country Park. There is a major obstruction to fish passage in the Country Park (Harrison's Weir), which is likely to be a barrier to most fish species in all but the highest flows. It is believed that a hydropower scheme is being installed on Harrison's Weir but it is currently unknown what provision (if any) for fish passage are being incorporated into its design. Parts of the Outer Pennine Ring Canal system, including the Huddersfield Narrow Canal and Ashton Canal, shadow the River Tame and tributaries along much of its length, crossing the river at several points.

Much like the rest of the Mersey Basin, the River Tame catchment area has historically been subjected to anthropogenic influences on its water quality. Although some marked improvements have occurred in the last decade or so, recent BOD measurements from the River Tame, although within an acceptable range (0.6 – 4.8 mg/L), appear to go through periodic oscillations (Figure 5.2). Despite these levels being within the non-harmful range for fish, the recent increasing trend perhaps suggests there is an additional factor which may have a secondary impact on fish population.

The total ammonia data from the River Tame catchment does not display the same oscillation as with the BOD data but highlights a decline between 2000 and 2015, from 0.26 – 0.14 mg/L in 2000 and rising year on year to 0.21 mg/L by 2015 (Figure 5.3). These levels are low and thus may not reflect a trend but rather spatial-temporal variations that are within the standard error for this catchment. However, regardless of trends, the levels of total ammonia are consistently low enough over the past 20 years for the catchment to be suitable to support both salmonids and cyprinids.

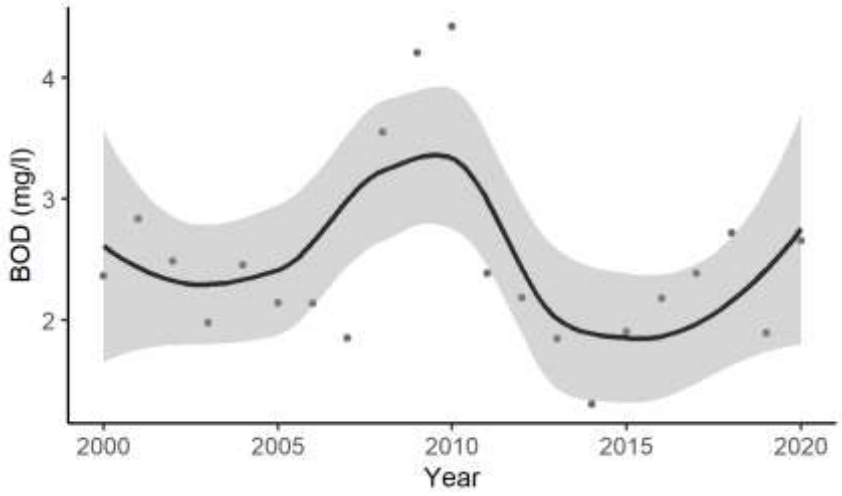

Figure 5.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Tame FMC between 2000 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

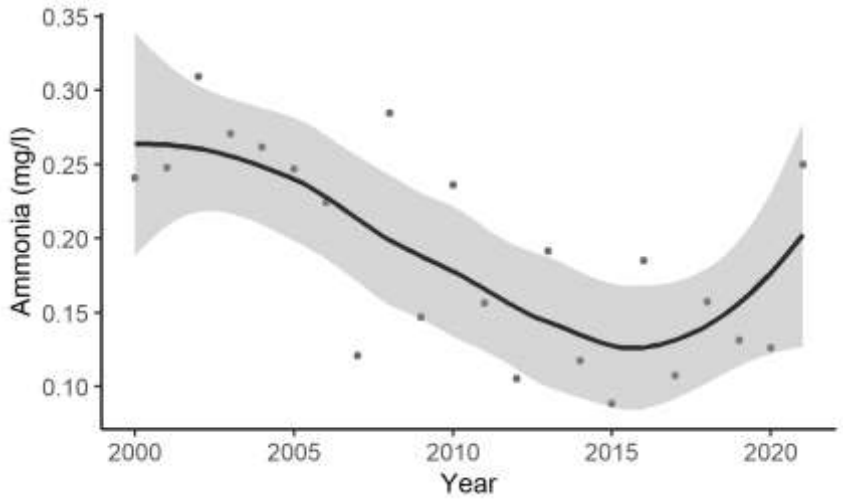

Figure 5.3: Ammonia in mg/L across the River Tame FMC between 2000 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

5.2 Current Fish Population Status

Recent data on the fish populations within the River Tame FMC were available from EA routine monitoring data, angler catch records and consultancy-led ecological reports (Table 5.1). It has shown that the River Tame has a species richness of 18 with five notable species.

Table 5.1: Fish species identified in the River Tame between 2015 and 2020.

Riverine species	Migratory species
Barbel	Atlantic salmon
Common bream	Sea trout
Bullhead	European eel
Brown trout	
Common carp	
Chub	
Dace	
Grayling	
Gudgeon	
Minnow	
Perch	
Pike	
Roach	
Stone loach	
Three-spined stickleback	

In common with the Mersey FMC data, the fish community in the Tame appears diverse with most species present that would be expected for a river of this type. As with the River Mersey, other species that might be expected would include tench, ruffe and rudd in the lower reaches.

Stocking records available show that no stocking has occurred in the past five years but several thousand chub, dace and barbel were stocked in 2011/12 and almost 60,000 chub, dace, trout and roach were introduced between 1996 – 2001.

Chub, dace and barbel have been recorded by anglers within the past five years, potentially indicating that the most recent stocking in 2011/12 has been successful. Given the lifespan of these fish species however, juvenile data are required to confirm that self-sustaining populations have been established.

Interestingly, the River Tame recorded the now extinct burbot in 1880 (at a length of 38 cm). Burbot are believed to have become extinct in the UK during the early 1970s following widespread deterioration in water quality and habitat degradation. Plans to re-introduce burbot into the UK are underway and the reintroduction of burbot into the River Tame is a long-term aspiration for the Trust.

As is the case for the River Mersey, relatively little is known about the fish population status in the numerous tributaries of the River Tame. Hence survey effort is required to establish presence/absence data of fish species in these streams along with data on habitat condition.

5.3 Fish Population Objectives

The long-term objectives for the River Tame FMC are to provide sustainable and abundant populations of the existing species observed in the past five years, throughout the sub-catchment where habitat is suitable. Not all species will be anticipated to be found in all reaches of the river, but given free movement by addressing obstructions, fish species would be expected to distribute naturally and disperse through the catchment area where habitat is appropriate.

The initial objective for 2025 is to establish a population condition assessment of the fish species identified and highlight any constraints to the various fish life stages. The MRT long-term objective is to overcome those constraints, whether driven by water quality, obstructions and/or habitat, once identified. This should remove the bottlenecks to provide stable, sustainable, and abundant diverse fish populations in the River Tame FMC.

Known constraints within the catchment include:

1. Obstructions to migration on the River Tame at Harrison's Weir.
2. Effects of urban run-off and siltation on water quality and siltation of riverbed substrates negatively impacting upon fish and fish food organism habitats.

5.4 Immediate Actions

The immediate requirement is to address the lack of data on fish species abundance and distribution in the tributary streams of the River Tame and investigate the juvenile status of

populations within the main stem of the river. The presence/absence of juvenile Atlantic Salmon and coarse fish species (previously stocked) is of particular concern. The objective is to confirm species presence using a variety of survey techniques and provided data on relative abundance, spawning success, and recruitment to allow an initial assessment of constraints and to allow interventions to be developed as required.

1. Fish surveys: FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers match and logbook catch records and eDNA sampling above major obstructions and tributary streams.
2. Obstacles & habitat mapping: Habitat data are required for the River Tame FMC including information on:
    a. Obstructions during high and low flows to coarse fish and migratory salmonids;
    b. habitat quality for coarse fish and salmonid adults;
    c. coarse fish and salmonid spawning habitat availability, distribution, and quality; and,
    d. coarse fish and salmonid juvenile habitat availability, distribution, and quality.
3. Identify the habitat, obstructions and/or water quality constraints that might prevent the reintroduction of burbot to the catchment (linked to point 2).

6. RIVER MEDLOCK FMC

6.1 Fisheries Management Catchment Summary and Tributaries

The River Medlock flows for a distance of 32 km from its source to the River Irwell. It rises east of Oldham in the hills around Strinesdale and flows through a steep wooded gorge between Lees and Ashton-Under-Lyne and then through Daisy Nook Country Park. Downstream of the Country Park, the river flows west through urban areas until it reaches the open parkland of Clayton Vale and Phillips Park in East Manchester before entering one of the many culverted sections under the Etihad Stadium (Figure 6.1). The Medlock continues to flow west through the centre of Manchester, much of it culverted under buildings, until it reaches the confluence with the River Irwell through an underground tunnel. In the urban areas where the river is open, it is often heavily constrained in a rectangular concrete channel to reduce flood risk and prevent encroachment. The urban riverbed is heavily contaminated with silt and frequently rubble, debris and litter from adjacent buildings and the surrounding urban environment.

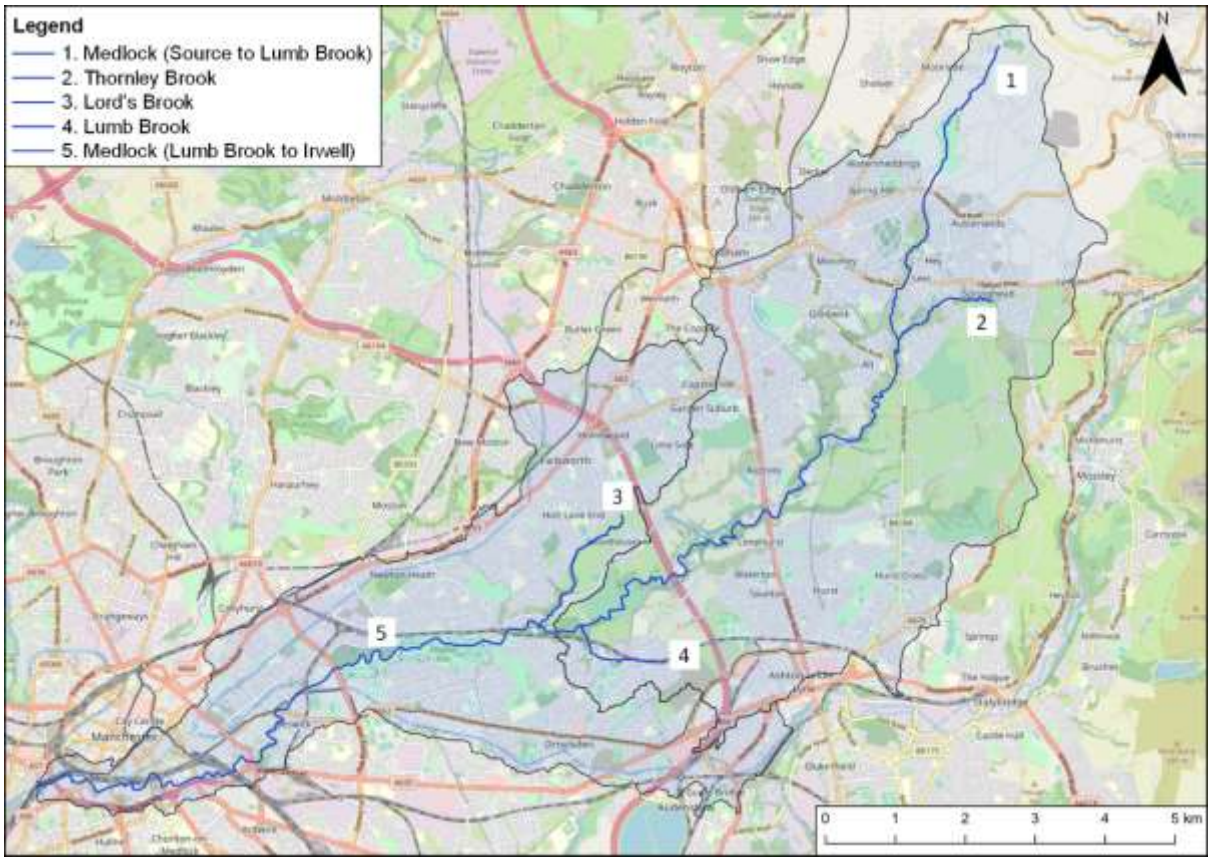

Figure 6.1: River Medlock FMC and its associated watercourses.

The River Medlock was historically badly affected by industrial and sewage-derived pollution resulting in BOD and ammonia levels exceeding 25 and 7.5 mg/L, respectively in the 1980s (Figure 6.2 and Figure 6.3). However, in recent years water quality has improved significantly with BOD being consistently recorded below 6 mg/L over the past twenty years (Figure 6.2) representing good ecological conditions. Furthermore, the most recent data (2010 onwards) has shown a further improvement with BOD levels falling to ≈ 2 mg/L which means the BOD levels in the River Medlock are at a level which can support salmonid populations.

Total ammonia levels within the River Medlock have seen a significant improvement from the historic high level (over 8.5 mg/L – see Figure 6.3). Since 2000, the improvement in ammonia levels appears to have plateaued but year-on-year decreases are still observed from 0.4 mg/L in 2000 to 0.12 mg/L in 2020. This general decrease implies that organic enrichment has been further reduced within the catchment over the past 20 years to levels which are suitable for both salmonids and cyprinids.

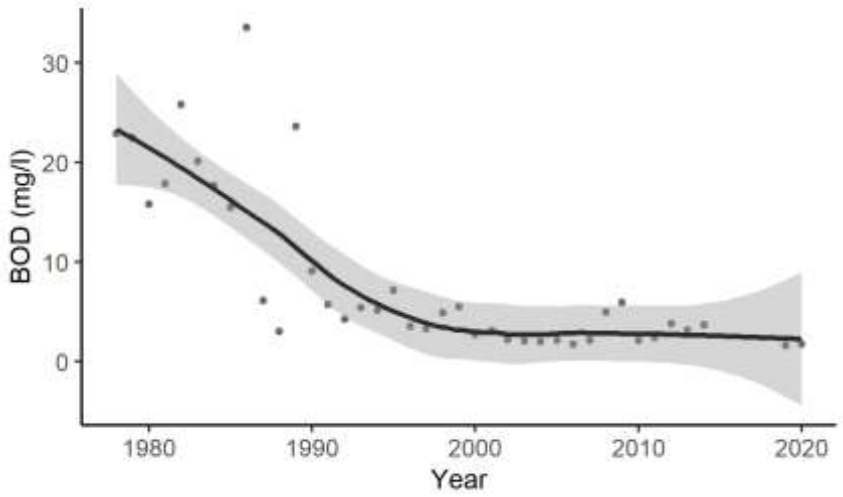

Figure 6.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Medlock FMC between 1978 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

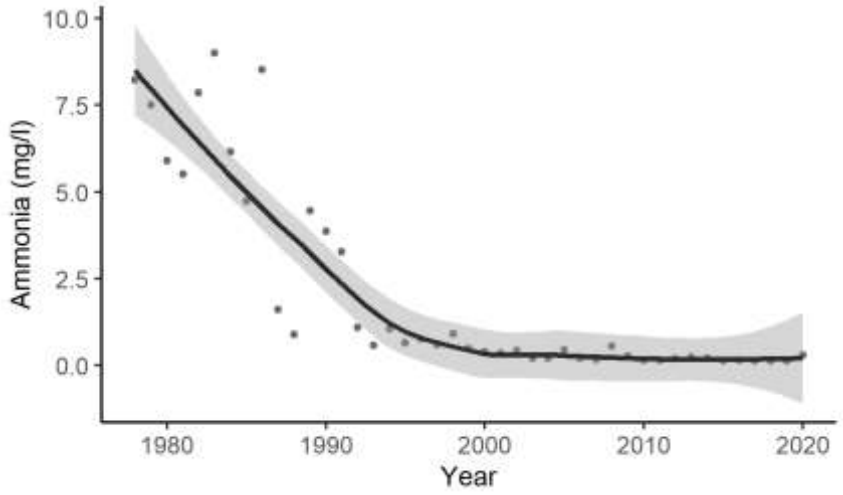

Figure 6.3: Ammonia in mg/L across the River Medlock FMC between 1978 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

Despite these recent water quality improvements, severe habitat restrictions continue to affect fish populations due to the heavily modified nature of the river channel, with no migratory species identified in any recent fish data.

6.2 Current Fish Population Status

Recent fisheries data for the River Medlock FMC is available from the EA routine monitoring programme, angler catch data and consultancy-led ecological reports (Table 6.1). It has shown that the River Medlock has a moderate species richness of eight with two notable species but no migratory species. In addition to this, data has revealed that no stocking has been completed in the River Medlock during the past 5 years but historically there has been stocking of over 62,000 individual chub, minnow, dace and roach.

Table 6.1: Fish species recorded in the River Medlock FMC between 2015 and 2020.

River species	Migratory species
Chub	(None)
Brown trout	
Stone loach	
Bullhead	
Minnow	
Roach	
Dace	
Three-spined stickleback	

A more varied fish community might be expected, including species such as perch for example, which was recorded in the Medlock in 2013 but absent from recent records. It is likely that perch are still within the River Medlock FMC rather than the river experiencing localised extinction. It is likely that a lack of sampling effort is driving these inconsistencies in the data. Further monitoring is, therefore, required to provide additional information on the species assemblage in the River Medlock FMC.

6.3 Fish Population Objectives

The long-term objectives for the River Medlock FMC are to provide sustainable and abundant populations of both the existing species observed in the past five years and those that have been identified as absent but which could be expected to be present following actions to provide adequate water quality and habitat. The additional riverine species expected for the River Medlock FMC are outlined in Table 6.2 below.

The River Medlock is a tributary of the River Irwell and the confluence is upstream of the obstructions on the Manchester Ship Canal, the uppermost of which is Mode Wheel locks. Migratory species which are expected to be present (if not for the obstructions of the Manchester Ship Canal) include Atlantic salmon, European eel, sea lamprey and river lamprey (Table 6.2). Overcoming the obstructions in the Manchester Ship Canal is required for the establishment of these migratory (diadromous) species in the River Medlock FMC.

Table 6.2: Additional species anticipated to be present in the River Medlock FMC following the completion of the long-term water quality and habitat objectives.

Riverine species	Migratory species
Barbel	Atlantic salmon
Common bream	European eel
Grayling	River lamprey
Gudgeon	Sea lamprey
Pike	
Perch	
Rudd	
Ruffe	

The objectives for the River Medlock FMC are:

1. Establish the current extent of fish species present in the Medlock;
2. Establish the status of coarse fish and trout recruitment, including the distribution and abundance of juvenile stages; and,
3. Facilitate the return of additional coarse fish species along with migratory species including Atlantic salmon, eel and lamprey species.

6.4 Immediate Actions

The following immediate actions proposed for the River Medlock FMC are:

1. Fish surveys – FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers match and logbook catch records and eDNA sampling above and below major obstructions and tributary streams.
2. Obstacles & habitat mapping – Habitat data are required for the River Medlock FMC including information on:
    a. obstructions during low flows to coarse fish and migratory fish, addressing any data gaps identified following completion of current work to create a database of fish obstructions in the FMC that is being carried out by the Irwell Catchment Partnership;
    b. coarse fish and salmonid spawning habitat availability, distribution, and quality; and,
    c. coarse fish and salmonid juvenile habitat availability, distribution and quality.

7. RIVER IRK FMC

7.1 Fisheries Management Catchment Summary and Tributaries

The River Irk rises to the east of Royton and flows for a total of 37 km from its source to the Irwell confluence in Manchester. The river flows past Chadderton, Middleton and Blackley before reaching Manchester, flowing past Harpurhey and Collyhurst before reaching the city centre. The last reach of the river is culverted for several hundred metres below Victoria Station in city centre Manchester (Figure 7.1) before joining the River Irwell.

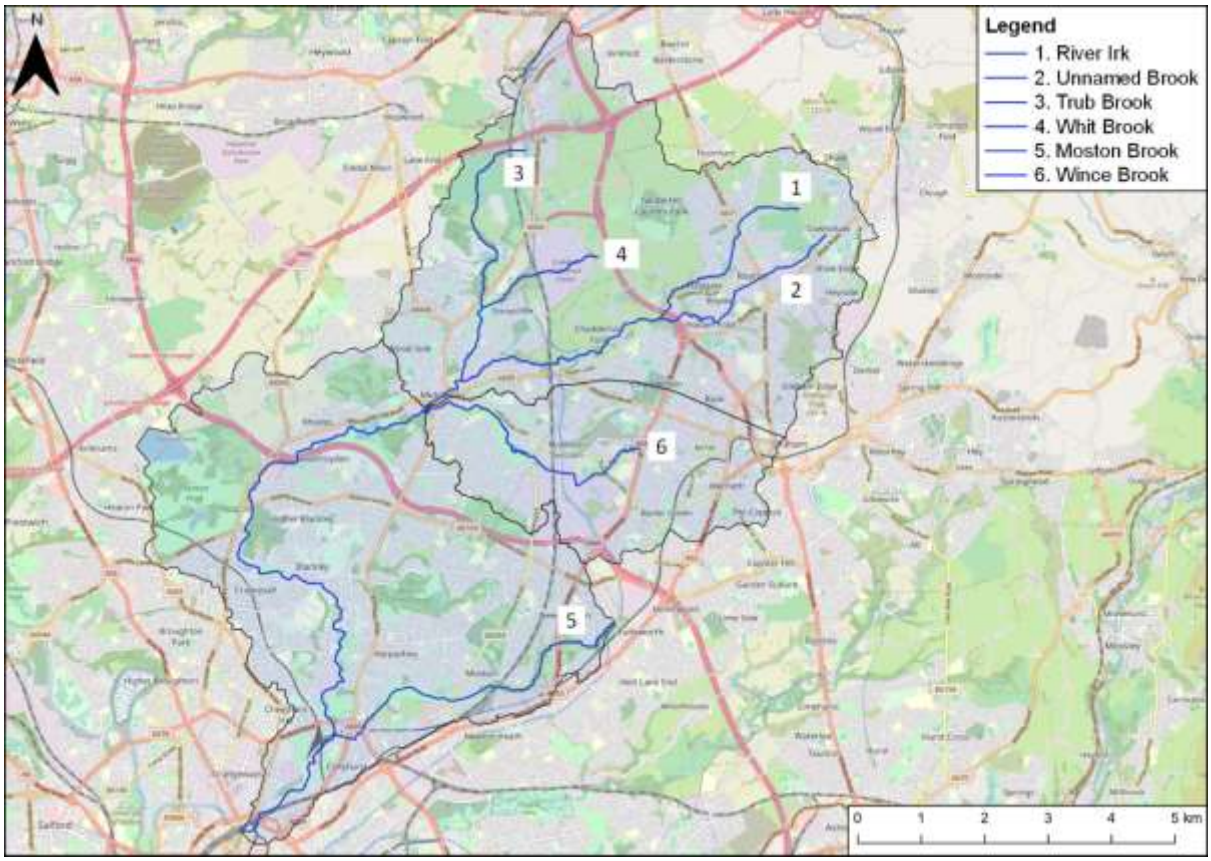

Figure 7.1: River Irk FMC and its associated watercourses.

The River Irk is notorious for the industrial pollution it suffered during the nineteenth and twentieth centuries and is heavily modified to the extent that many miles of its banks are made from dressed stone. There are many obstructions along its course, both barriers and culverts, but the full extent of the current obstacles to fish passage for fish species is currently unknown.

The water quality of the River Irk has significantly improved in respect of BOD in the last ten years, decreasing from 5.9 mg/L to 1.4 mg/L representing good water quality (Figure 7.2). In contrast, over the same period the total ammonia concentrations for the catchment have remained relatively stable chiefly recording values of < 1 mg/L (Figure 7.3). With both low BOD and total ammonia levels, water quality in the River Irk is now suitable for both salmonids and cyprinids.

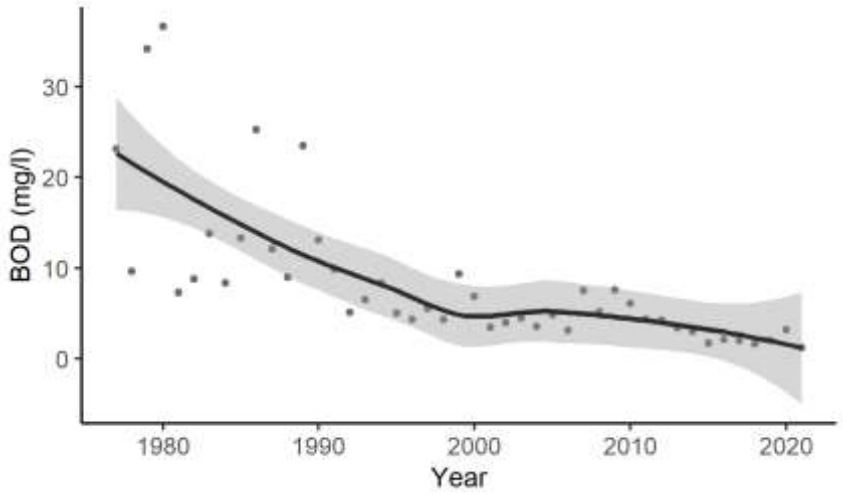

Figure 7.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Irk FMC between 1977 – 2021 (data from the EA Water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

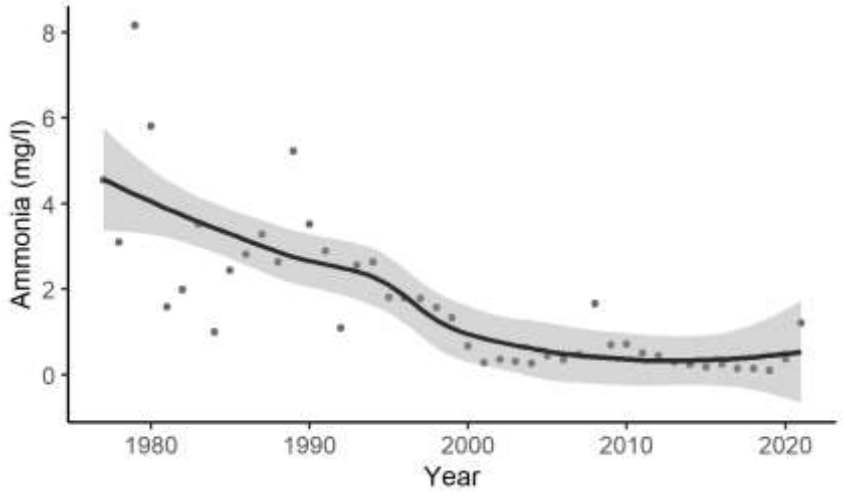

Figure 7.3: Ammonia in mg/L across the River Irk FMC between 1977 – 2021 (data from the EA Water quality data archive). Grey dots represent average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

7.2 Current Fish Population Status

Recent fisheries data are lacking in the River Irk FMC with data only available from angler catch records and consultancy-led ecological reports. These data suggest that the River Irk has a species richness of five (Table 7.1), with no migratory species. Furthermore, available stocking records show that no stocking has occurred in the River Irk during the past five years but historically brown trout, dace and chub have been stocked at total numbers exceeding 10,000 individuals.

Table 7.1: Fish species recorded in the River Irk FMC between 2015 and 2020.

Riverine species	Migratory species
Chub	(None)
Brown trout	
Dace	
Minnow	
Three-spined stickleback	

The fish population in the River Irk appears very sparse. However, anecdotal evidence suggests that individual specimen brown trout are caught by anglers in parts of the River Irk and the presence of such large fish is believed to be a result of the recent water quality improvements and likely a productive system to support these individuals. Further fish species are therefore likely to be present but due to a lack of sampling effort and/or low levels of catch reporting by anglers, species richness appears to be poor. Monitoring is therefore required to provide further information and improved evidence of the current species composition.

7.3 Fish Population Objectives

A provisional list of fish species it is considered should be present in the River Irk given its proximity to the Irwell in its lower reaches has been tabulated in Table 7.2, although monitoring may reveal additional species. Migratory species listed include species that should be present if obstructions, water quality and/or habitat constraints are addressed. Overcoming the obstructions in the Manchester Ship Canal (such as the uppermost obstruction of Mode Wheel locks) and in the River Irk itself are, however, required for the establishment of these species in the River Irk.

Table 7.2: Additional fish species that should be present in the River Irk once water quality, obstruction and habitat constraints have been removed.

Riverine species	Migratory species
Grayling	Atlantic salmon
Perch	European eel
Roach	Sea lamprey
Barbel	River lamprey
Common bream	
Pike	
Gudgeon	
Bullhead	
Stone loach	
Rudd	
Ruffe	

Owing to the lack of baseline data from the River Irk FMC, the following objectives have been set:

1. Establish the current extent of fish species present in the Irk;

2. Establish the status of coarse fish and brown trout recruitment, including the distribution and abundance of juvenile stages;
3. Facilitate the return of migratory species including Atlantic salmon, eel and lamprey species.

7.4 Immediate Actions

It is proposed that the following immediate actions are taken:

1. Fish surveys: FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers match and logbook catch records and eDNA sampling above and below major obstructions and tributary streams.
2. Obstacles and habitat mapping: habitat data are required for the River Irk FMC including information on:
    a. obstructions during high and low flows to coarse fish and migratory salmonids, addressing any data gaps identified following completion of current work to create a database of fish obstructions in the FMC that is being carried out by the Irwell Catchment Partnership;
    b. coarse fish and salmonid spawning habitat availability, distribution, and quality; and,
    c. coarse fish and salmonid juvenile habitat availability, distribution, and quality.

8. RIVER IRWELL, BOLTON AND ROCHDALE RIVERS FMC

8.1 Fisheries Management Catchment Summary and Tributaries

The River Irwell rises at Irwell springs on Deeply Moor north of Bacup, flowing west to Rawtenstall before heading south through Ramsbottom to Bury. Above Bury, the river is upland in nature but changes to an increasingly urbanised setting within Bury. The river turns west again and is joined by its first major tributary, the River Roch, just before passing through Radcliffe in Springwater Park. The Irwell continues to flow to Prestolee where it is joined by another major tributary, the River Croal at Nob End SSSI.

The Roch and the Croal tributary river catchments of the Irwell upstream of Salford are both included in this FMC. These tributary catchments extend across relatively large geographical areas comprising of various rivers and brooks, which we have referred to collectively as the "Rochdale Rivers" and "Bolton Rivers" in this document:

- **Rochdale Rivers**: River Roch and tributaries including River Beal, River Spodden, Naden Brook and Hollins Brook
- **Bolton Rivers**: River Croal and tributaries including River Tonge, Bradshaw Brook, Eagley Brook, Astley Brook, Blackshaw Brook and Middle Brook.

Downstream of the Croal confluence, the River Irwell turns in a south easterly direction to Salford, flowing between Agecroft and Kersal before entering a large meandering bend (the Kersal Wetlands) and heading south again through Salford. The river is quite substantial in size with heavily modified banks as it flows past Salford University before entering another substantial meander around The Meadow. At this point, Adelphi Weir is encountered, representing a substantial current barrier to fish migration. As the river rounds Blackfriars, it forms the boundary between the cities of Salford on the north bank and Manchester on the south (Figure 8.1).

Two further tributaries, the rivers Irk and Medlock enter the Irwell in its lowest reach prior to it reaching the Manchester Ship Canal. Both rivers - due to their heavily modified physical condition and water quality issues, each of these rivers have separate FMC strategies (see previous sections).

Downstream of the Medlock confluence, the River Irwell becomes the Manchester Ship Canal at Woden Street footbridge: this is the start of the upper pound of the canal and is continuous with the River Irwell. Since there is no barrier to fish movement within this upper pound, this uppermost section of the canal is included in this River Irwell FMC down to the first obstruction, Mode Wheel Locks. This section of the canal includes the large Turning Basin, some 28 hectares in size, a waterbody more akin to an on-stream lake rather than a river. The downstream freshwater Manchester Ship Canal section from Mode Wheel Locks to Irlam Locks has its own FMC strategy given its very specific water quality, habitat and obstruction constraints.

Water quality in the Irwell FMC has improved dramatically over recent decades with substantial reductions in both sewage-derived and industrial pollutants as seen in the historical water chemistry records (Figure 8.2 and Figure 8.3). The BOD over the past twenty years has remained relatively stable with average levels at 3 mg/L (Figure 8.2). Similar trends are noted for total ammonia with average levels below 0.5 mg/L (Figure 8.3). This highlights that the water quality of the River Irwell has improved from historical levels and thus could support

cyprinids in addition to more sensitive fish species such as salmonids. Artificial aeration is, however, still required to maintain adequate oxygen levels for fish in the Turning Basin of the Manchester Ship Canal due to the combination of deep, stratified water and high sediment oxygen demand.

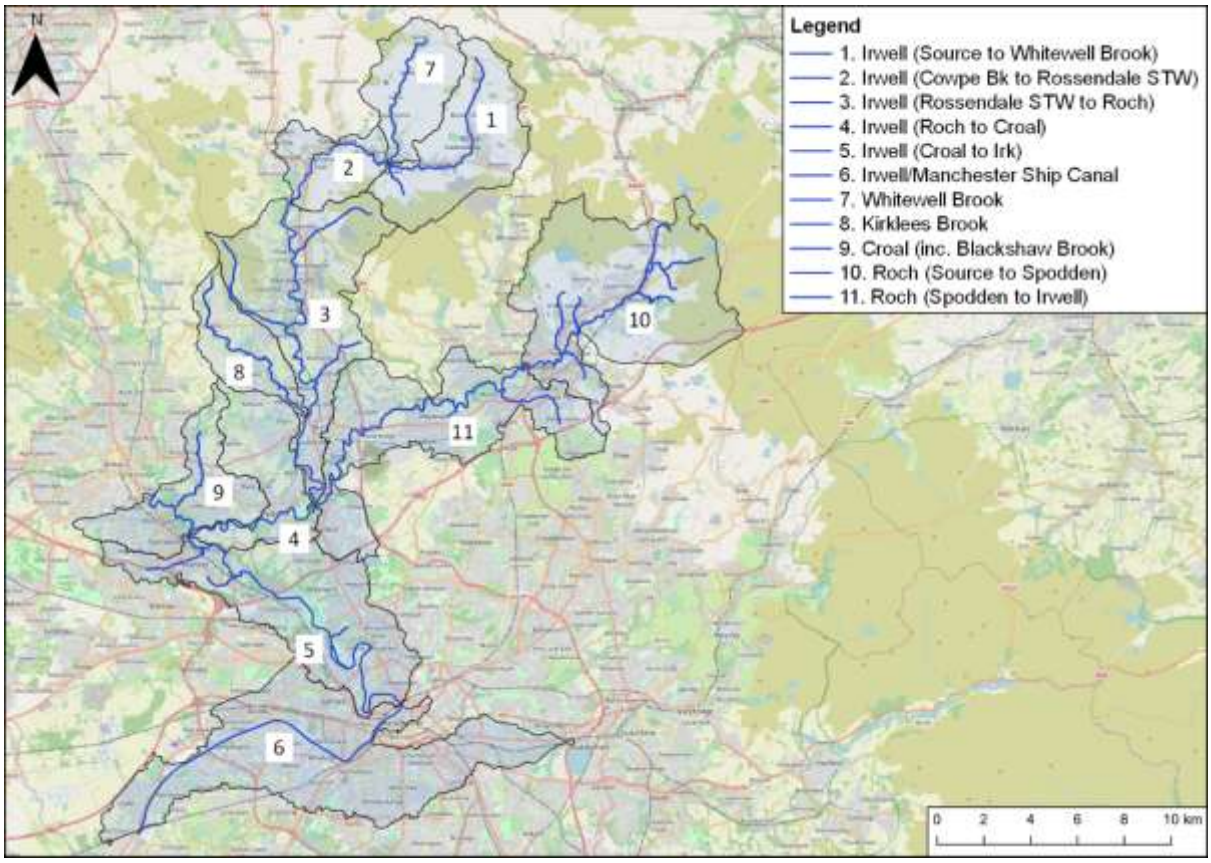

Figure 8.1: River Irwell, Bolton and Rochdale Rivers FMC and its associated watercourses.

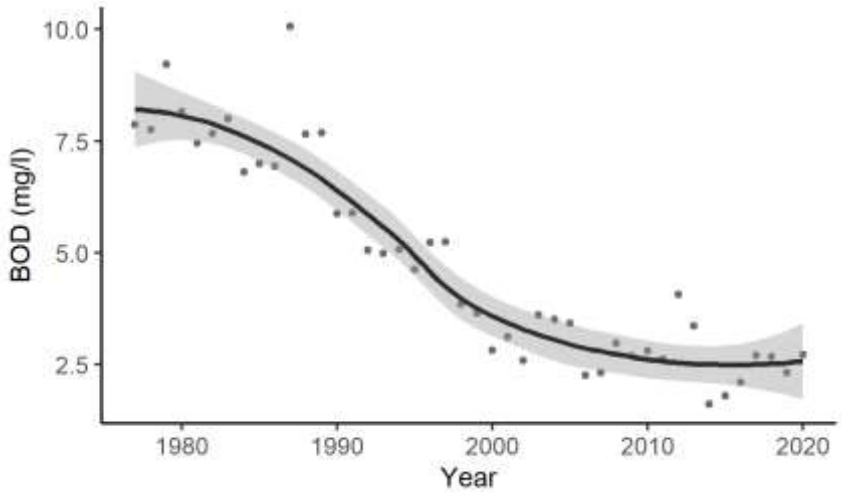

Figure 8.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Irwell, Bolton and Rochdale Rivers FMCs between 1977 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

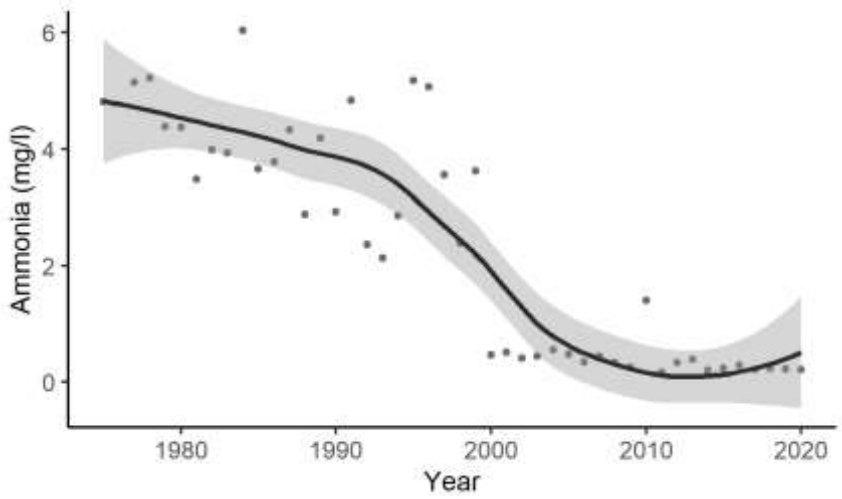

Figure 8.3: Ammonia across the River Irwell, Bolton and Rochdale Rivers FMC between 1975 – 2020 (data from the EA Water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

In common with several other FMCs in the Mersey Basin, river flows in this FMC are substantially higher in dry weather conditions than would naturally occur. This is because of the large number of impounding reservoirs in the upper catchment that continually release compensation flows into the river system plus the large quantity of water imported into the catchment from further north (e.g. from the Lake District) by pipes and aqueducts for public water supply: this imported water eventually enters the River Irwell catchment through the sewerage system. In some river reaches, over 90% of the dry weather flow is derived from compensation flow release and returned sewage effluent (albeit treated to a high standard due to successive improvements in sewage treatment over the past 30 years). Consequently, the channel size in some rivers and streams is considerably larger than it would have been naturally prior to the industrial revolution.

8.2 Current Fish Population Status

Recent fisheries data for this FMC are available from both the Environmental Agency monitoring programme, angler catch returns and from consultancy-led ecological reports. It has highlighted that in the past five years, the FMC has a diverse fisheries assemblage with a species richness of 18, but with no migratory species present (Table 8.1).

Further to these records, over 17,000 fish including barbel, dace, chub and grayling have been stocked throughout the Irwell sub-catchment in the past five years and brown trout have historically been stocked up to 2001. Roach (including hybrids) were introduced as recently as 2014 and have been stocked annually over the preceding 3 years. All these species have been recorded in recent angler catch returns (2015 to 2020) highlighting that the stocking programme has potentially been a success.

Table 8.1: Fish species recorded in the River Irwell, Bolton and Rochdale Rivers FMCs between 2015 and 2020.

Riverine species	Migratory species
Barbel	(None)
Brown trout	
Common bream	
Bullhead	
Common carp	
Chub	
Dace	
Grayling	
Gudgeon	
Minnow	
Perch	
Pike	
Roach	
Rudd	
Ruffe	
Stoneloach	
Tench	
Three-spined stickleback	

The fish community within the FMC appears reasonably diverse, with many of the species anticipated to be present from historic evidence appearing in the species list. Information on abundance, however, is sparse and anecdotal, particularly concerning juvenile populations. Further information on recently stocked juvenile fish species is required and forms an important objective to determine the life-cycle completion success of the introduced species. Further information regarding fish presence, age structure and relative abundance throughout the FMC, including the many tributaries, is required.

Species noted in this FMC but which are not present in the River Mersey include rudd and ruffe. The only other rivers in the Mersey Basin where these fish are known to be present are the Sankey Brook (for rudd) and the River Glaze (for ruffe).

Notable fish species that are absent from this FMC but which are present elsewhere (e.g. River Mersey) include Atlantic salmon, European eel and lamprey species. All three latter species are likely to be impacted by the water quality and physical barriers created by the Manchester Ship Canal and its lock systems together with barriers in the River Irwell upstream of the canal. The three large locks of the Manchester Ship Canal at Mode Wheel, Barton and Irlam represent substantial barriers to fish migration, possibly both upstream and downstream. Water quality, specifically dissolved oxygen, within the canal can further act as a barrier to fish movement in both directions. For example, whilst upstream migration of Atlantic salmon is obstructed by the lock structures, downstream migration of juvenile stage smolts in May/June might also be impeded by poor water quality in the canal (i.e. low dissolved oxygen levels).

Similarly, the downstream migration of adult eel in late summer/ autumn may be affected by the low dissolved oxygen levels, whilst the upstream spring run of juvenile eel (elvers) is most likely blocked by the canal lock system and upstream barriers in the River Irwell. Hence it is not surprising that eel have not been recorded in the Irwell, Bolton Rivers and Rochdale Rivers

FMC. Lamprey species have also not been recorded. It is however surprising that brook lamprey is not present in this FMC as they should be able to complete their life cycle within the catchment.

Of the coarse fish species, silver bream is not present and might be expected in the lower reaches of the River Irwell.

One issue of known concern in the lower River Irwell is the feminisation of fish caused by endocrine disruption. A very high frequency of feminisation has been observed in roach and perch from the Turning Basin area of the Manchester Ship Canal above Mode Wheel Locks. Whilst the ecological significance of feminisation of fish is not fully known, the prevalence and population impact of the condition needs to be understood if the Mersey Basin is to achieve its full potential. Closing this knowledge gap is essential when we know that some rivers, like the Irwell, comprise of over 90% sewage effluent during dry weather flows.

8.3 Fish Population Objectives

Although at first glance the fish community of the Irwell FMC appears reasonably diverse, there are several significant areas of concern, including the absence of migratory fish, the observed feminisation of some species in the lower River Irwell and a lack of knowledge on juvenile stages and recruitment in coarse fish.

The long-term objectives for the FMC are to provide sustainable and abundant populations of both the existing species observed in the past five years and those that have been identified as absent but which could be expected to be present following actions to address obstructions, water quality issues and provide adequate fish habitat as set out in Table 8.2 below.

Table 8.2: Additional species anticipated to be present in the Irwell, Bolton Rivers and Rochdale Rivers FMC once water quality, obstructions and habitat issues have been overcome.

Riverine species	Migratory species
Silver bream	Atlantic salmon
	European eel
	River lamprey
	Sea lamprey

The objectives for the River Irwell, Bolton Rivers and Rochdale Rivers FMC are therefore:

1. Return of migratory species including Atlantic salmon, eels and lamprey species;
2. Establish the status of coarse fish recruitment, including the distribution and abundance of juvenile stages; and,
3. Investigate and understand the ecological significance of feminisation of fish.

8.4 Immediate Actions

The immediate actions required to meet these objectives are:

1. Fish surveys – FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers match and logbook catch records and eDNA sampling above and below major obstructions and tributary streams. Specific fish survey methods applicable to the Turning Basin of the Manchester Ship Canal will be agreed in dialogue with key stakeholders, including Manchester Ship Canal Company and the Environment Agency.
2. Obstacles and habitat mapping – Habitat data are required including information on:
    a. Obstructions during high and low flows to coarse fish and migratory salmonids;
    b. habitat quality for coarse fish and salmonids adults;
    c. coarse fish and salmonid spawning habitat availability, distribution and quality; and,
    d. coarse fish and salmonid juvenile habitat availability, distribution and quality.

At the time of writing a major EA study is nearing completion of the obstructions to fish migration along the Manchester Ship Canal (including Mode Wheel Lock) as well as Adelphi Weir in the lowest reach of the River Irwell. This will be a significant step in achieving the first immediate action above, alongside the current Irwell Catchment Partnership work to create a detailed fish obstruction database for the entire Irwell catchment.

9. RIVER GLAZE FMC

9.1 Fisheries Management Catchment Summary and Tributaries

The River Glaze (or Glaze Brook) is a tributary of the River Mersey system, entering the lower reach of the freshwater Manchester Ship Canal on its north bank in the section below Irlam Locks and above Bollin Point (known as Pound 4). This means the Glaze has a direct connection with the River Mersey and it is not affected by the problems associated with the lock systems elsewhere in the canal (Figure 9.1). Periodic water quality issues in Pound 4 (low oxygen) however, could still act as a barrier to fish migration at certain times of year and as such the Glaze and its tributaries is being treated as a separate FMC in its own right.

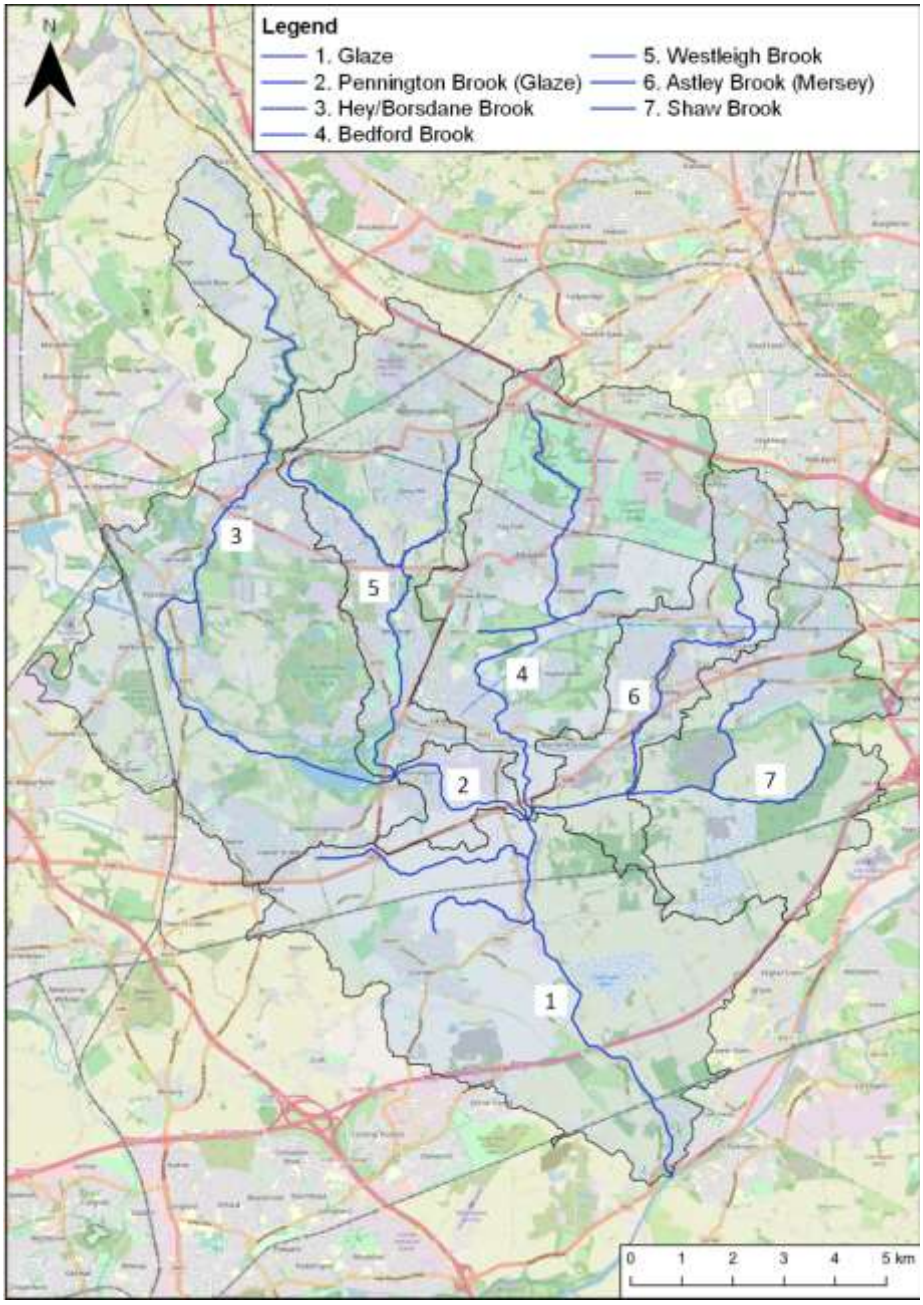

Figure 9.1: River Glaze FMC and its associated watercourses.

The River Glaze is approximately 35 km long, and typically lowland in nature draining the mainly flat land around Leigh, much of which is agricultural land. The river and its tributaries extend into former mining and industrial areas in which mining subsidence has created flashes (lakes) at Pennington and Westleigh. The River Glaze is formed from the outflow of Pennington Flash, close to Aspull Common. Pennington Flash itself is fed by Hey Brook, a continuation of Borsdane Brook which runs southwards from Blackrod. After picking up the waters of Bedford Brook, which runs southward from Leigh and the Black or Moss Brook coming west from Worsley via Chat Moss, the River Glaze turns southward, ultimately draining into the Manchester Ship Canal.

The water quality of the River Glaze FMC has improved significantly since the 1970s with year-on-year decreases in both BOD and ammonia (Figure 9.2 and Figure 9.3). For example, BOD has decreased from 7.3 mg/L in 1977 to levels of 2.3 mg/L in 2021 which represents good water quality (Figure 9.2). Equally, ammonia levels have seen the same decrease although it has plateaued in recent years to ≈ 0.35 mg/L (Figure 9.3). Low levels of both BOD and total ammonia within the River Glaze FMC highlight that this catchment is suitable for supporting both cyprinids and the more sensitive salmonid species.

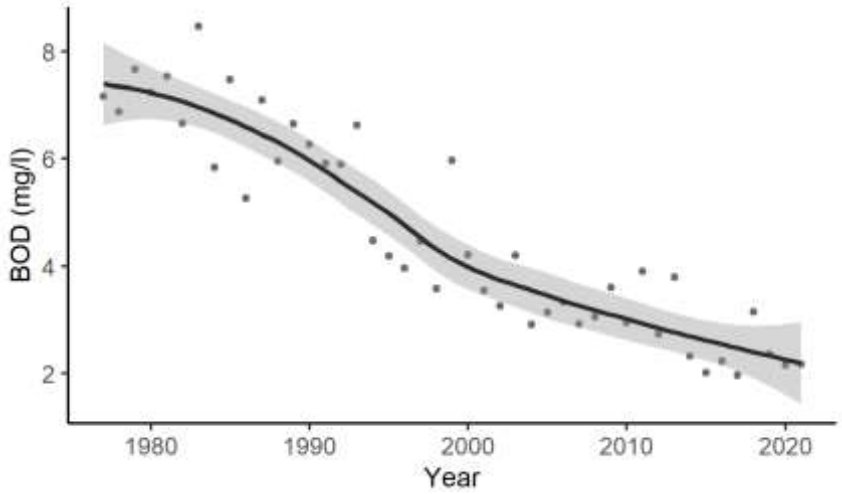

Figure 9.2: Biochemical Oxygen Demand (BOD) in mg/L across the River Glaze FMC between 1977 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

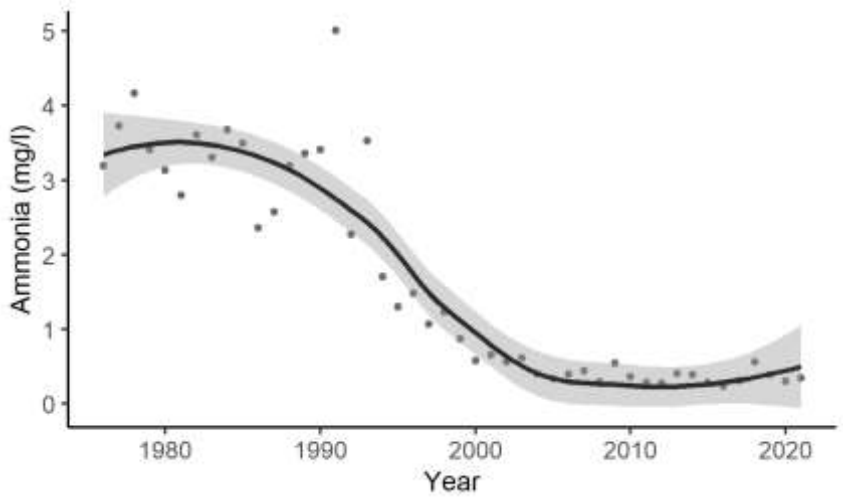

Figure 9.3: Ammonia in mg/L across the River Glaze FMC between 1976 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

9.2 Current Fish Population Status

Recent fisheries data for the River Glaze FMC are available from both the EA routine monitoring data and angler catch returns. The data have highlighted that the River Glaze has a diverse fisheries assemblage with a species richness of 19 (Table 9.1). Note, lamprey are not sub-divided in the data records into the three different species so lamprey species have been included under the migratory column for simplicity.

Table 9.1: Fish species recorded in the River Glaze FMCs between 2015 and 2020.

Riverine species	Migratory species
Chub	Atlantic salmon
Perch	Sea trout
Roach	European eel
Barbel	Lamprey sp.
Tench	
Brown trout	
Common bream	
Dace	
Pike	
Gudgeon	
Bullhead	
Ruffe	
Minnow	
Stone loach	
Three-spined stickleback	

Stocking records show that no stocking has occurred in the River Glaze during the past five years, although 1,500 chub, dace and roach hybrids were stocked in 2014.

The fish population in the River Glaze is diverse and largely mirrors that of the River Mersey. Grayling and common carp are species that are notably absent, probably as they have not been introduced here as in other parts of the catchment.

9.3 Fish Population Objectives

Although the fish population appears to be relatively diverse, there is little information on fish age structure and spawning success, and hence no indications of the sustainability or otherwise of the fish community. Monitoring is therefore required to determine the status of the fish community.

The long-term objectives for the FMC are to provide sustainable and abundant populations of both the existing species observed in the past five years and those that have been identified as absent but which could be expected to be present following actions to address obstructions, water quality issues and provide adequate fish habitat as set out in Table 9.2 below.

Table 9.2: Additional species anticipated to be present in the River Glaze FMC once water quality, obstructions and habitat issues have been overcome.

Riverine species	Migratory species
Common Carp	(None)
Grayling	

The objectives for the River Glaze FMC are:

1. Establish the status of coarse fish and trout recruitment, including the distribution and abundance of juvenile stages;
2. Establish the status of migratory species including Atlantic salmon, eel and lamprey species (including identification of the different lamprey species present);
3. Evaluate fish habitat for salmonid and coarse fish life stages.

9.4 Immediate Actions

1. Fish surveys – FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers match and logbook catch records and eDNA sampling above major obstructions and tributary streams.
2. Obstacles and habitat: Habitat data are required for the River Glaze FMC including information on:
    a. obstructions during low flows to coarse fish and migratory salmonids;
    b. coarse fish and salmonid spawning habitat availability, distribution and quality; and,
    c. coarse fish and salmonid juvenile habitat availability, distribution and quality.

10. SANKEY BROOK FMC

10.1 Fisheries Management Catchment Summary and Tributaries

The Sankey Brook is a tributary of the River Mersey system, entering the upper estuary downstream of Warrington, and flowing for a length of approximately 18 km. Sankey Brook is a lowland river, rising just to the east of Widnes and flowing in an easterly direction to Newton-Le-Willows before flowing south past Winnick Quays and approaching the Mersey estuary between Warrington and Great Sankey, and finally joining the estuary at Penketh (Figure 10.1). Sankey Brook is heavily urbanised for about a third of its length and passes through industrialised areas that historically resulted in significant water quality problems for the brook. It is believed there are hydraulic connections between Sankey Brook and Sankey Canal and/or St Helens Canal, however, there is a lack of detailed information available to understand fully how the canal system interacts with the brook.

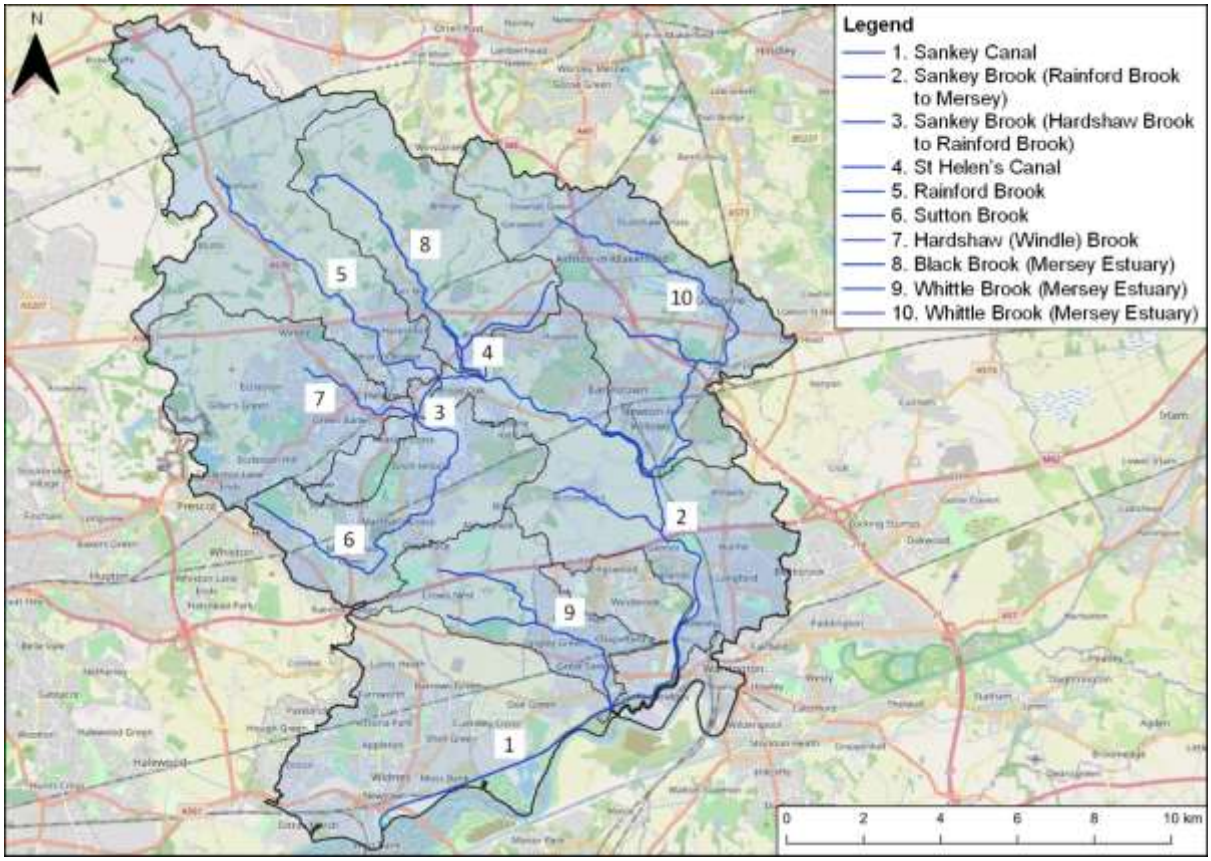

Figure 10.1: Sankey Brook FMC and its associated watercourses.

In recent years, water quality in Sankey Brook has improved significantly with BOD levels normally ranging between 1.5 – 3.5 mg/L (Figure 10.2). However, and more significantly, there was a sharp improvement in total ammonia levels between 2000 – 2008 from ≈ 1.45 mg/L to 0.35 mg/L and where it has remained stable since. The current levels of BOD and total ammonia levels represent an overall good water quality in the Sankey Brook FMC.

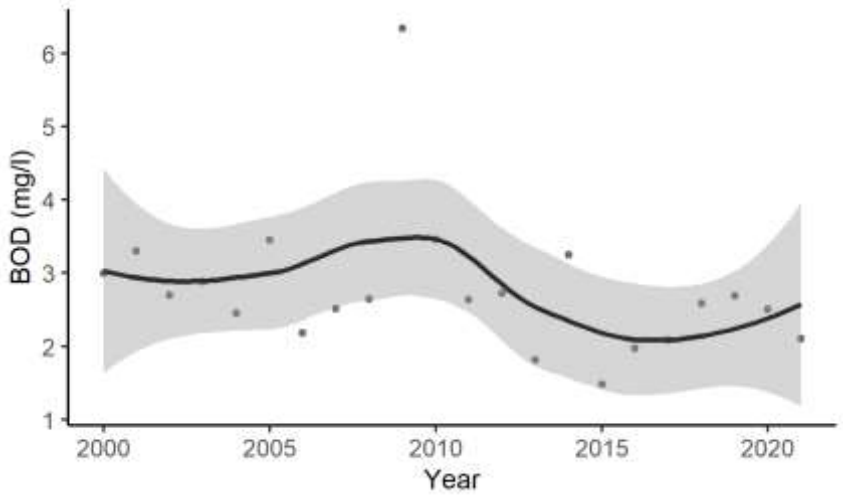

Figure 10.2: Biochemical Oxygen Demand (BOD) in mg/L across the Sankey Brook FMC between 2000 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

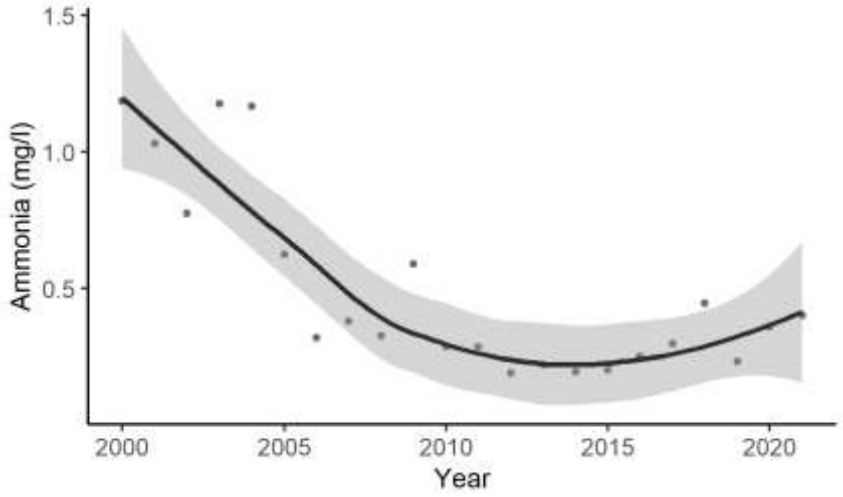

Figure 10.3: Ammonia in mg/L across the Sankey FMC Brook between 2000 – 2021 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

10.2 Current Fish Population Status

Recent fisheries data are available from both the EA routine monitoring programme and angler catch data. These indicate a diverse fisheries assemblage with a species richness of 17 (Table 10.1). Note, lamprey species consist of three species including the resident brook lamprey and the migratory river and sea lamprey. Note, lamprey are not sub-divided in the data records into the three different species so lamprey species have been included under the migratory column for simplicity. In addition to the species listed in Table 10.1, it is noted that gudgeon and stone loach were recorded as present in 2013: their absence in the 2015-2020 data does not imply that these two species are no longer present and further survey effort may find they are still present in the Sankey Brook.

Table 10.1: Fish species recorded in the Sankey Brook FMC between 2015 and 2020.

Riverine species	Migratory species
Chub	Lamprey sp.
Perch	European eel
Common carp	
Brown trout	
Roach	
Barbel	
Tench	
Common bream	
Dace	
Pike	
Gudgeon	
Bullhead	
Rudd	
Minnow	

Stocking records show that no stocking has occurred in the Sankey Brook during the past five years, although several thousand chub, dace and roach were stocked in 2013.

The fish population in the Sankey Brook is diverse and largely mirrors that in the lower reaches of the River Mersey. Grayling is notably absent, probably as it has not been introduced here as in other parts of the catchment. Atlantic salmon are also missing from the catchment, which is believed to be the result of obstructions: this cannot be quantified, however, due to lack of overall knowledge of fish obstructions in the FMC and the issues to fish passage they pose.

10.3 Fish Population Objectives

Although the fish population appears to be relatively diverse, there is little information on fish age structure and spawning success, and hence no indications of the sustainability of the fish community. In addition, the absence of migratory salmonids from a small river with direct access to the Mersey Estuary is of concern. Monitoring is required to determine the status of the fish community.

The long-term objectives for the FMC are to provide sustainable and abundant populations of both the existing species observed in the past five years and those that have been identified as absent but which could be expected to be present following actions to address obstructions, water quality issues and provide adequate fish habitat as set out in Table 10.2 below.

Table 9.2: Additional species anticipated to be present in the Sankey Brook FMC once water quality, obstructions and habitat issues have been overcome.

Riverine species	Migratory species
Grayling	Atlantic salmon

The objectives for the Sankey Brook FMC are:

1. Establish the status of coarse fish and trout recruitment, including the distribution and abundance of juvenile stages;
2. Establish the status of migratory species including Atlantic salmon; and,
3. Evaluate fish habitat for salmonid and coarse fish life stages.

10.4 Immediate Actions

To meet these objectives, it is recommended that the following immediate actions are taken:

1. Fish Survey: FMC- wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, anglers' match and logbook catch records and eDNA sampling above and below major obstructions and tributary streams.
2. 2. Obstacles and habitat: Habitat data are required for the Sankey Brook FMC including information on:
    a. obstructions during high and low flows to coarse fish and migratory salmonids;
    b. coarse fish and salmonid spawning habitat availability, distribution and quality; and,
    c. coarse fish and salmonid juvenile habitat availability, distribution and quality.

11. DITTON BROOK FMC

11.1 Fisheries Management Catchment Summary and Tributaries

Ditton Brook is a tributary of the Mersey Estuary. It is a short lowland river (7 km in length) flowing in a southwest direction to the Mersey Estuary, forming the northern boundary of Halewood. Ditton Brook itself is fed by Netherley Brook that flows from Huyton to Widnes (Figure 11.1) and which is part of this FMC. Ditton Brook flows through large industrial areas once dominated by the chemical industry and much of the catchment land is contaminated. The rest of the streams in the FMC flow through greenbelt dominated by parks, golf courses and agriculture, with adjacent residential developments.

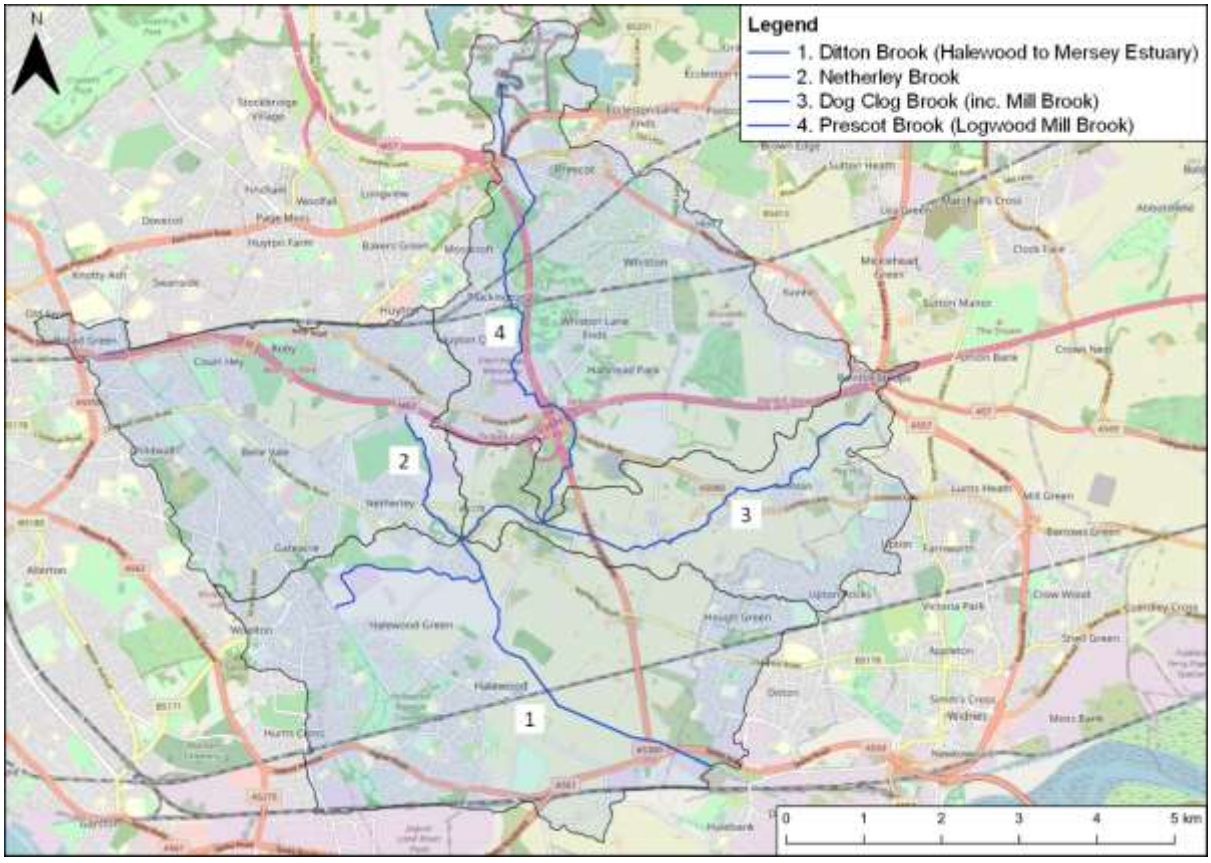

Figure 11.1: Ditton FMC and its associated watercourses.

The Ditton Brook FMC has suffered historic pollution from industry and leaching from the adjacent contaminated land. In recent years, water quality has improved but relatively high BOD levels remain with records over the past 20 years ranging between 5 – 6 mg/L (Figure 11.2). In addition, in 2014 a peak of 275 mg/L was observed (not displayed in Figure 11.2) but the cause of this outlier peak value is unknown but is possibly due to a pollution incident. The prevailing BOD trend potentially suggests that Ditton FMC is subjected to discharges of elevated levels of pollutants, albeit sporadically.

Ammonia levels have improved since 2010 with levels recorded between 2.0 – 2.5 mg/L over the past two decades (Figure 11.3). However, there are individual spikes which exceed 5 mg/L. The cause of these spikes in levels are also unknown but with spikes in both ammonia

and BOD it is likely that sporadic pollution events are still occurring within the Ditton FMC catchment.

The average BOD and ammonia levels recorded in the Ditton FMC in the last 20 years highlight that the catchment is currently only suitable for cyprinid species, with BOD acting as the limiting factor on salmonid colonisation. However, with evidence of episodic pollution events where thresholds for both ammonia and BOD exceed those even for cyprinids, there remains the potential for future fish kills. It will therefore be imperative that the causes of the observed sporadic pollution events are identified as they will impact future management strategies.

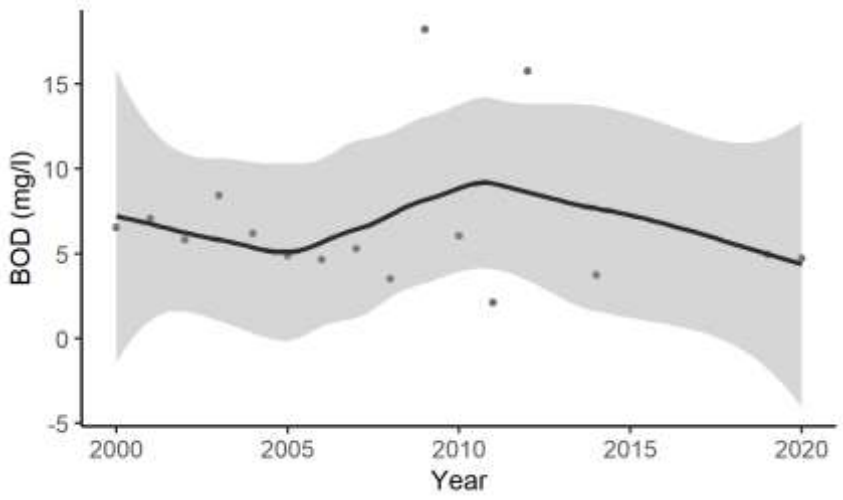

Figure 11.2: Biochemical Oxygen Demand (BOD) in mg/L across the Ditton FMC between 2000 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

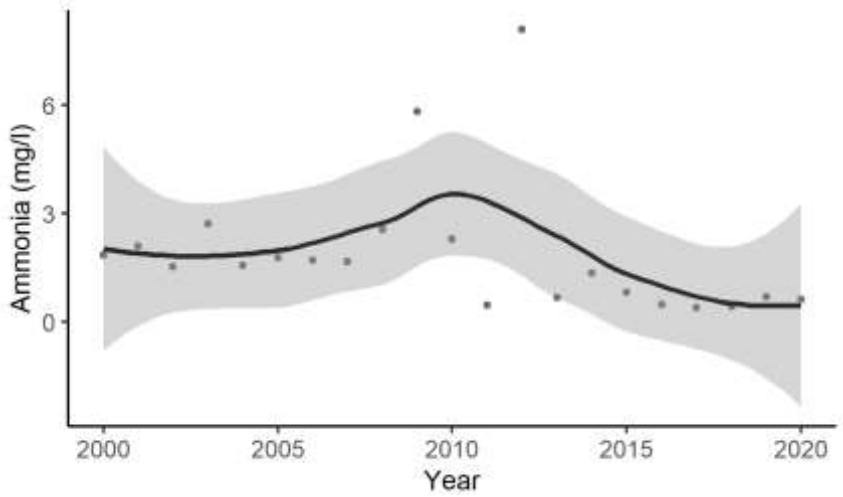

Figure 11.3: Ammonia in mg/L across the Ditton FMC between 2000 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

11.2 Current Fish Population Status

No recent fish records from any source have been identified, although a single record of eel was recorded from an EA electric fishing survey in 2014. No data were found from anglers' catch records.

Stocking records show that no stocking has occurred in the Ditton Brook during the past 5 years.

In the absence of any recent data, it is provisionally assumed that the current fish community in the Ditton Brook will be poor in light of the observed water quality conditions and likelihood of sporadic pollution events. The lack of fish data over recent years is currently unknown.

Immediate actions are required to gather information on the fisheries baseline for Ditton Brook FMC for more specific objectives and actions to be developed.

11.3 Fish Population Objectives

Monitoring will be required to develop the objectives for this FMC, but a provisional list of anticipated species that could be present in the Ditton Brook is provided in Table 11.1 assuming that water quality, habitat and fish access are improved to allow for the colonisation and dispersal of fish in Ditton Brook:

Table 11.1: Fish species that could be present within the Ditton Brook in the future should water quality, habitat conditions and fish access allow.

Riverine species	Migratory species
Grayling	Atlantic salmon
Perch	Sea trout
Roach	Sea lamprey
Barbel	River lamprey
Brown trout	
Dace	
Common bream	
Pike	
Gudgeon	
Bullhead	
Minnow	
Stone loach	
Three-spined stickleback	
Rudd	
Ruffe	

The objectives for the Ditton Brook FMC are:

1. Establish the status of coarse fish and any brown trout recruitment, including the distribution and abundance of juvenile stages;

2. Establish the status of any migratory species that may be present, including Atlantic salmon, European eel and lamprey species; and,
3. Evaluate fish habitat for salmonid and coarse fish life stages.

11.4 Immediate Actions

To achieve the objectives in this FMC, the following immediate actions are required:

1. Fish surveys – FMC-wide using point abundance semi-quantitative techniques including electric fishing and micro-mesh seine netting, and eDNA sampling above and below major obstructions and tributary streams. Specific angling events might be appropriate in future depending on the results from other survey methods.
2. Obstacles and habitat mapping – Habitat data are required for the Ditton Brook FMC including information on:
    a. obstructions during high and low flows to coarse fish and migratory salmonids;
    b. coarse fish and salmonid spawning habitat availability, distribution and quality;
    c. coarse fish and salmonid juvenile habitat availability, distribution and quality; and,
    d. current pollution risks and associated water quality status.

12. MANCHESTER SHIP CANAL FMC

12.1 Management Catchment Summary and Tributaries

The Manchester Ship Canal FMC extends from Mode Wheel Locks (location 2 in Figure 12.1) downstream to Irlam Locks (location 1 in Figure 12.1). The freshwater flow in this section of the canal is primarily provided by the River Irwell catchment (including the Rivers Irk and Medlock). There is also a small number of small tributaries draining directly into this FMC, such as Salteye Brook. The uppermost Manchester Ship Canal pound upstream of Mode Wheel Locks is included the River Irwell, Bolton Rivers and Rochdale Rivers FMC. The freshwater section of the Manchester Ship Canal from downstream of Irlam Locks to Bollin Point is included in the River Mersey FMC.

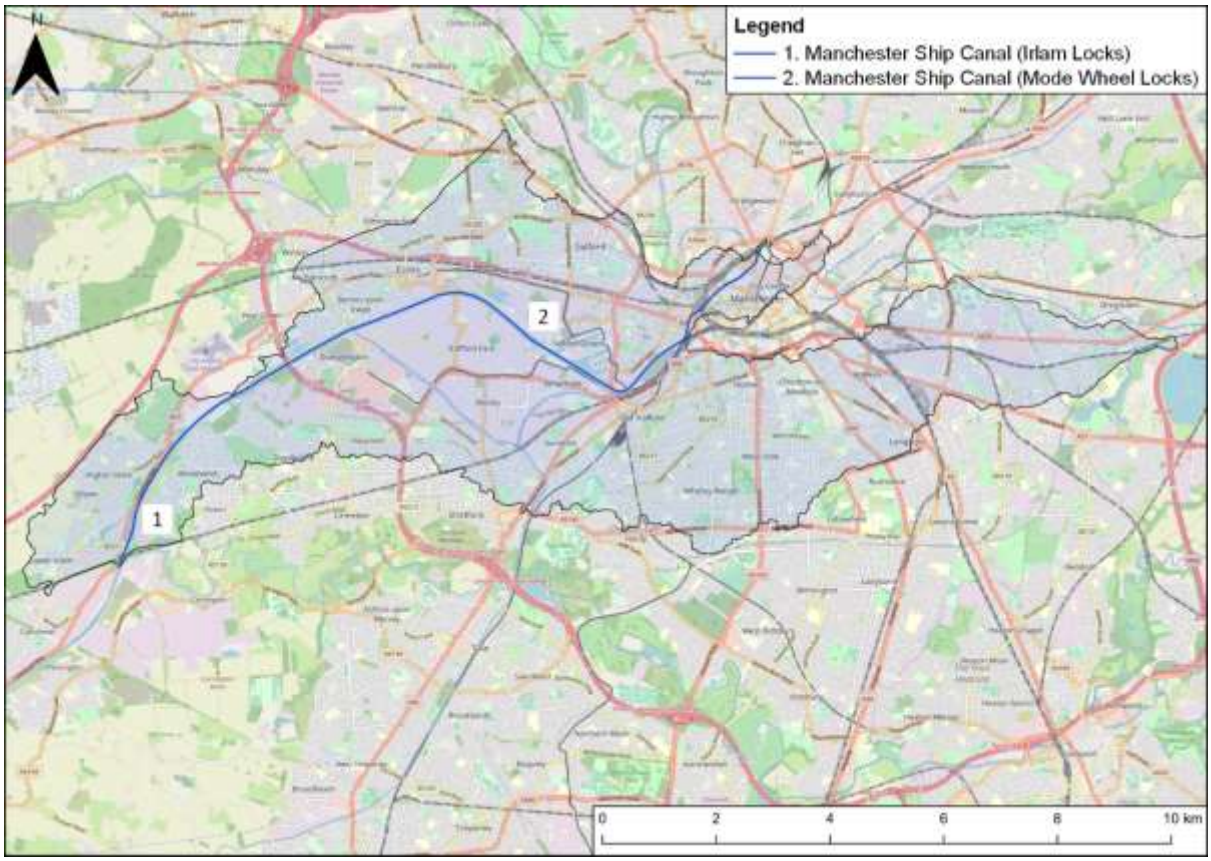

Figure 12.1: Manchester Ship Canal FMC and its associated watercourses.

There are very specific water quality, obstruction and physical habitat constraints for fish populations in this ≈15km section of the freshwater Manchester Ship Canal, hence the need for a separate FMC. In the long term, once these issues for fish have been adequately addressed, it is hoped to combine this FMC with the River Irwell, Bolton Rivers and Rochdale Rivers FMC to form one single connected hydrological unit.

Water quality in the Manchester Ship Canal FMC has improved dramatically over recent decades both because of improvement to the quality of inflowing rivers but also due to improvements in the quality of direct effluent discharges to the canal itself. Improvements in the water quality can be seen in the significant decline in both BOD and total ammonia

concentrations (Figure 12.2 and Figure 12.3). Total ammonia has particularly improved over the past two decades following investment at wastewater treatment works discharging into the canal, with year-on-year reductions such that current levels are now ≈ 0.5 mg/L (Figure 12.3). These trends of BOD and total ammonia highlight that the level of organic enrichment entering the Manchester Ship Canal FMC has substantially decreased and water quality conditions are now at levels considered suitable for both cyprinids and more sensitive salmonid species to inhabit the canal. The treated sewage discharge from Davyhulme wastewater treatment works, which provides a flow equivalent to a large tributary river, is a good example of this improvement, with substantial enhancement to effluent discharge quality having been achieved in recent decades.

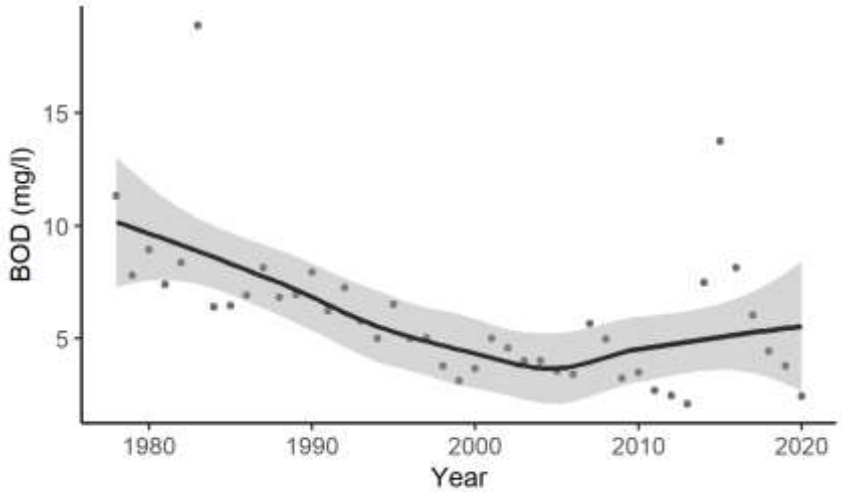

Figure 12.2: Biochemical Oxygen Demand (BOD) in mg/L across the Manchester Ship Canal FMC between 1978 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

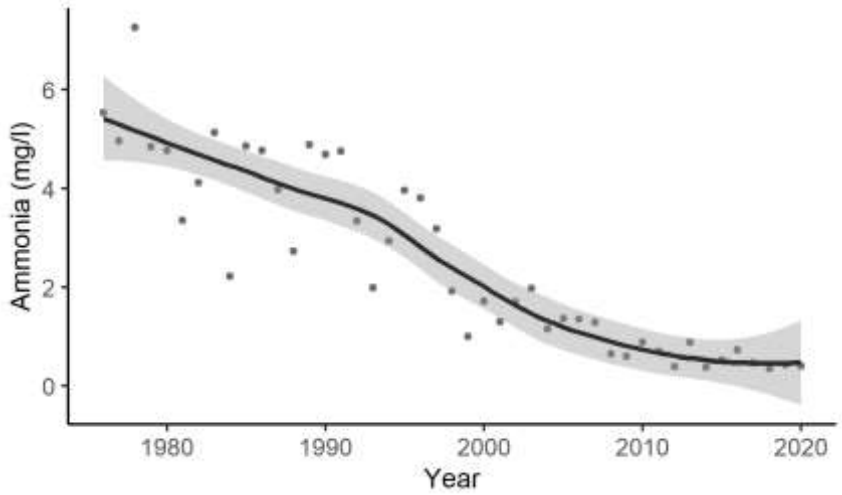

Figure 12.3: Ammonia in mg/L across the Manchester Ship Canal FMC between 1976 – 2020 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

However, despite these canal water quality improvements, the highly modified nature of the canal channel for navigation, together with a high sediment oxygen demand in the canal, results in rapid water stratification and stagnation during warm weather and low flow periods. These conditions lead to a deterioration in water quality can cause severe oxygen stress. As the canal lock structures at Irlam, Barton and Mode Wheel are all currently not passable to fish, fish mortality can result from the severe oxygen stress as the fish are effectively trapped in the two pounds between these locks. Work is currently underway by the Environment Agency to examine fish passage options for Barton and Mode Wheel Locks and Mersey Rivers Trust is engaging with key stakeholders through its newly formed Manchester Ship Canal Partnership Forum to investigate and subsequently to alleviate the episodic low oxygen levels that occur in the canal.

The Salteye Brook tributary of the canal has been subject to significant water quality problems in the past. Improvements to water quality in the lower reach of Salteye Brook are anticipated soon with the removal of direct effluent discharges from Eccles wastewater treatment works from the lower reaches (discharges will instead be made directly into the Manchester Ship Canal).

As with the River Irwell catchment, it is important to note that a substantial part of the flow in the Manchester Ship Canal FMC is derived from sewage effluent under low flow conditions, albeit treated to a high standard as a consequence of successive improvements to sewage treatment over the past 30 years.

In addition to the above obstruction and water quality issues, the fish habitat within the Manchester Ship Canal is extremely challenging for all fish species due to the non-natural, artificial physical structure of the canal (the depth, channel geometry and habitat are not like a river). There is also a notable lack of any fringe habitat, particularly fringe macrophytes that might be expected to provide spawning and nursery habitat for coarse fish species.

12.2 Current Fish Population Status

There are no recent fisheries data from the EA or angler catch returns available to inform the Manchester Ship Canal FMC fisheries baseline. However, ecological reports from studies undertaken by consultants (APEM) in 2007/8, have shown that the FMC contains a relatively diverse fish assemblage with a species richness of eight (Table 12.1) but, as expected, with no migratory species.

Table 12.1: Fish species recorded in the Manchester Ship Canal FMC from historic ecological reports (2007/8).

Riverine species	Migratory species
Roach	(None)
Brown trout	
Gudgeon	
Common bream	
Dace	
Perch	
Chub	
Pike	

It is not known whether the fish identified in 2007/8 are from self-sustaining populations, but larval common bream were caught in Pounds 1 and 4 only. The other coarse fish species may have arrived in the FMC via the undershot sluices which form part of the lock system in each of the three pounds. However, it is known that these fish did not originate from stocking as records show that no stocking into the Manchester Ship Canal FMC has taken place.

Notable fish species that are absent from the FMC but which are present elsewhere (e.g. in the River Mersey) include the migratory Atlantic salmon, European eel and lamprey species. All of these species are likely to be impacted by the water quality and physical barriers created by the canal and its lock system. The three large locks at Mode Wheel, Barton and Irlam represent substantial barriers to fish migration, possibly both upstream and downstream.

In addition, water quality, and specifically episodic low levels of dissolved oxygen, within the canal can also act as a barrier to fish movement in both directions. For example, whilst upstream migration of Atlantic salmon is certainly obstructed by the lock structures, downstream migration of juvenile salmon smolts in May/June might also be impeded by poor water quality in the canal (low dissolved oxygen levels). Similarly, the downstream migration of adult eel in late summer/autumn may be affected by low dissolved oxygen levels, whilst the upstream spring run of juvenile eel (elvers) is most likely blocked by the lock system.

The issue of feminisation of fish caused by endocrine disruption found in the River Irwell (see earlier) is also likely to present in the Manchester Ship Canal FMC due to the high proportion of the flow derived from treated sewage effluent in low flow conditions. Very high frequency of feminisation has been observed in roach and perch from the Manchester Ship Canal Turning Basin area upstream of Mode Wheel Locks. Whilst the ecological significance of feminisation of fish is not fully known, the prevalence and population impacts of this condition need to be understood if the Mersey Basin rivers are to achieve their full potential.

12.3 Fish Population Objectives

The Manchester Ship Canal FMC should support diverse and self-sustaining fish populations provided fish can move freely between the various pounds by provision of fish passes and that dissolved oxygen levels within the pounds can be maintained at or around 4 mg/L. Based on the fish populations that exist in the River Mersey and/or the River Irwell (or which were historically present prior to the industrial revolution), we have set out in Table 12.2 below those fish species which we consider could be present in the Manchester Ship Canal FMC should future water quality and fish access conditions allow.

In conclusion, there are many areas of concern relating to fish in the Manchester Ship Canal FMC, the major ones being:

1. Barriers to migration from the major lock systems: Irlam, Barton and Mode Wheel;
2. Periodic dissolved oxygen depletion within the canal pounds between the three locks;
3. A lack of fringe habitats along the canal banks; and,
4. The ecological impacts of feminisation of coarse fish.

Table 12.2: Additional fish species assumed that could be present within the Manchester Ship Canal should future water quality and fish access allow.

Riverine species	Migratory species
Barbel	Atlantic salmon
Bullhead	Lamprey species
Common carp	European eel
Grayling	
Minnow	
Rudd	
Ruffe	
Silver bream	
Stone loach	
Tench	
Three-spined stickleback	

12.4 Immediate Actions

To address the above areas of concern and to meet MRT's fisheries strategy objectives, the following immediate actions are proposed for the Manchester Ship Canal FMC:

1. Fish surveys – subject to obtaining the necessary permissions from the canal owner, repeat the 2007/8 fish survey of the two canal pounds between Mode Wheel and Irlam Locks, plus dedicated anglers match and logbook catch records where possible and eDNA sampling in each of the two pound along with the main tributaries that discharge directly into the canal. Review similar survey data from the riverine FMCs that contribute to the River Irwell inflow to the canal upstream of the Turning Basin;
2. Obstacle mapping – Feasibility of fish pass provision at Irlam, Barton and Mode Wheel locks, with and without hydropower development, in particularly taking into account the findings of a current feasibility study being carried out by the Environment Agency for Barton and Mode Wheel locks in dialogue with the canal owner;
3. Oxygen refuges – investigations and trials for the provision of fish oxygen refuges both in line and off-line in pounds two and three between Mode Wheel and Irlam Locks respectively; and,
4. Evaluate options for providing coarse fish spawning and juvenile habitat along the fringes of the canal and opportunities for off-line spawning refuges along its length.

13. MERSEY ESTUARY FMC

13.1 Fisheries Management Catchment Summary and Tributaries

The Mersey Estuary FMC originates at the tidal limit of the main stem of the River Mersey at Howley Weir in Warrington and drains into Liverpool Bay in the eastern Irish Sea (Figure 13.1). Given the size of the estuary, many rivers drain directly into the estuary, in particular the River Weaver and River Gowy, along with the Wirral Rivers, Ditton Brook and Sankey Brook. These waterbodies are discussed in their own FMC sections and are not covered here.

Figure 13.1: The Mersey Estuary FMC (blue shaded area).

Water quality in the Mersey Estuary has improved dramatically over recent decades both because of improvement to the quality of the inflowing rivers but also due to improvements in the quality of direct discharges to the estuary itself. However, routine water quality monitoring by the EA in the Mersey Estuary has reduced in recent years. For example, BOD data are only available between 2000 – 2009 but during this time it appears relatively stable at concentrations averaging approximately 3 mg/L. It is assumed that, given the upstream river FMC catchments have improved in recent years, that the BOD concentrations in the Mersey Estuary are likely to have also improved. However, this represents a clear knowledge gap.

Ammonia data for the Mersey Estuary FMC are available up to 2017, but no samples have been recorded since. However, the available results importantly highlight a significant improvement in total ammonia over the last 20 years from 3 mg/L to 0.7 mg/L (Figure 13.3). This highlights the improvements observed within the river FMCs draining to the estuary (see

previous sections of this report), and importantly supports the BOD improvement assumption above. These water quality improvements mean that the estuary can support both the more saline tolerant cyprinid species and migratory fish species (including eel and salmonids).

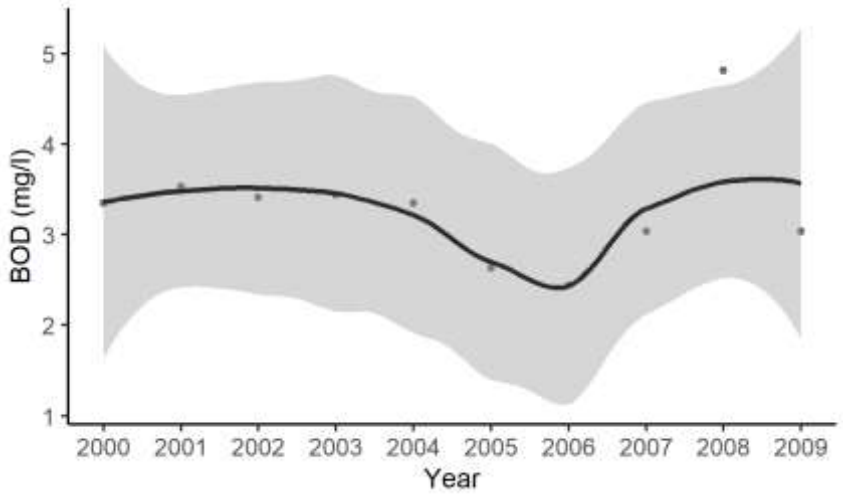

Figure 13.2: Biochemical Oxygen Demand (BOD) in mg/L across the Mersey Estuary FMC between 2000 – 2009 (data from the EA water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

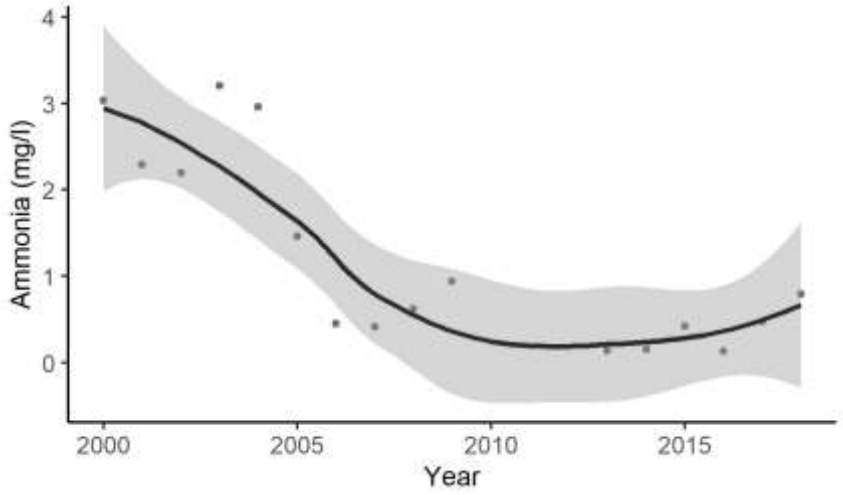

Figure 13.3: Ammonia in mg/L across the Mersey Estuary FMC between 2000 – 2017 (data from the EA Water quality data archive). Grey dots represent the average annual points, the black line represents a trend line across the time series, and the grey shading indicated the standard error.

13.2 Current Fish Population Status

Recent fisheries data are available from the routine EA monitoring programme, angler catch records and from consultant-led reports. The data show that the Mersey Estuary FMC has a diverse habitat that can support a range of fish from both freshwater (migratory) and marine backgrounds (Table 13.1).

The data presented in Table 13.1 are made up of the EA's Transitional and Coastal waters (TraC) data rather than the EA's freshwater National Fish Population Database. It identifies predominantly marine fish species within the Mersey Estuary and Mersey Mouth areas. Historical TraC data indicate the presence of multiple migratory fish species, including river lamprey, sea lamprey and smelt, though these have not been recorded in recent years. In addition to the EA monitoring data, the Mersey Gateway Environmental Trust has kindly provided data to MRT from its recent fish monitoring programmes which including beam trawling and eDNA surveys from the Mersey Estuary.

Table 13.1 includes several fish species that have not been identified in the historic evidence of fish species set out in Table 1.1 of this document. These are indicated by the inclusion of their Latin names for completeness (the Latin names for the other species shown the table have already been provided in Table 1.1).

Table 13.1: Fish species recorded in the Mersey Estuary FMC between 2015 and 2020.

Riverine species	Marine species	Migratory species
Brown trout	5-bearded rockling	Atlantic salmon
Bullhead	Butterfish (*Pholis gunnellus*)	European eel
Minnow	Atlantic cod	Smelt
Pike	Small-spotted catshark	River lamprey
Stone loach	Common sole	Sea trout
Ruffe	Common goby (*Pomatoschistus microps*)	Sea lamprey (*Petromyzon marinus*)
Roach	Common dab	
Common carp	Flounder	
Grayling	Herring	
Three-spined stickleback	Pogge	
	Lesser pipefish	
	Lesser weever (*Echiichthys vipera*)	
	European plaice	
	Pilchard	
	Poor cod (*Trisopterus minutus*)	
	Pouting (*Trisopterus luscus*)	
	Raitt's sandeel (*Ammodytes marinus*)	
	Sand goby	
	European sea bass (*Dicentrarchus labrax*)	
	Solenette (*Buglossidium luteum*)	
	Sprat	
	Thornback ray (*Raja clavata*)	
	Tub gurnard (*Chelidonichthys lucernus*)	
	Whiting	

13.3 Fish Population Objectives

Given the historically poor status of the Mersey Estuary and the Poor to Moderate ecological status of the rivers of the Mersey Basin (as classified at 2019), the long-term objectives for the Mersey Estuary must be to restore conditions that promote sustainable populations. These objectives should focus on species that have been recorded during the past five years, as well as those species that have historically been recorded in the estuary, but which have not been observed in recent years. The additional species that could be present in the future in the Mersey Estuary FMC with further environmental improvements have been presented below in Table 13.2 and include several species noted in the historic references prior to the industrial revolution (see Table 1.1 at the beginning of this report). Some additional species are included (as indicated by the provision of both the common name and the Latin name in Table 13.2) that were not referenced in the historical evidence.

Table 13.2: Additional fish species that could be present within the Mersey Estuary should further environmental improvements in the estuary, to the rivers draining to the estuary and/or to marine waters be made in the future.

Marine or estuarine species	Migratory species
Atlantic sturgeon	Allis shad
Dragonet (*Callionymus lyra*)	Twaite shad
Greater pipefish (*Syngnathus acus*)	
Greater weever (*Trachinus draco*)	
Lesser sandeel (*Ammodytes tobianus*)	
Lumpsucker (*Cyclopterus lumpus*)	
Megrim (*Lepidorhombus whiffiagonis*)	
Sand smelt (*Atherina presbyter*)	
Thick lipped grey mullet	
Transparent goby (*Aphia minuta*)	
Viviparous blenny (*Zoarces viviparus*)	
Shore rockling (*Gaidropsarus mediterraneus*)	
Long-spined sea scorpion	

Initial objectives for 2025 should be to establish the presence/absence and population condition of these species and, where possible, to identify constraints (whether pertaining to water quality, physical habitat and/or water quality (including marine / estuarine water temperature), or a combination of these - or other factors, such as commercial fishing) that may account for the absence of these species in the estuary (or the associated rivers for migratory fish species).

Known constraints within the Mersey Basin system include:

- Poor water quality due to historic urbanisation and industrial activity

- Possible historic contamination of sediments and foreshore
- Chemical water quality (including very poor dissolved oxygen saturation) and physical habitat modification
- Lack of suitable spawning and lifecycle habitat.
- Particularly high levels of endocrine disruptors in the estuary (Defra, 2002).

13.4 Immediate Actions

There are a number of immediate actions which are required to inform knowledge gaps:

1. Identify existing fish monitoring programmes planned for the upper, middle and outer Mersey Estuary to help provide possible cost savings and survey efficiencies working in partnership with other interested stakeholders;
2. Identify resource gaps with other interested stakeholders and develop a comprehensive collaborative monitoring programme across all life stages to provide essential data to understand the current status of the Mersey Estuary fish community and facilitate future restorative planning activities;
3. Identify the factors that are contributing to the reduced species diversity and overall constriction of species movement within the estuary and the wider catchment draining to the estuary. Given the wealth of literature discussing various causes of poor ecological conditions within the estuary and wider catchment, a literature review to identify and prioritise areas for intervention and/or restorative measures may allow for the limitations to fish community development to be removed.

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