River Camel Valley and Tributaries SSSI

Condition Assessment

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Author

Naomi-Beth Dixon

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Executive summary

A river SSSI is a protected riverine area designated for its special scientific interest, of which there are just over 44 across the whole of England. These rivers are recognised for their importance in terms of ecology, habitats and biodiversity, and exemplify the best rivers for nature and ecosystem services in the country. The River Camel Valley and Tributaries SSSI is one of these rivers. The protected river, tributaries and associated woodlands, carr, fen, heath and wet meadows are of great ecological importance, supporting endangered species such as Atlantic salmon and habitats such as semi-natural ancient woodland. The De Lank River is of national importance as an outstanding upland acid river.

The previous assessment of the SSSI conducted in 2010 found the river to be in unfavourable condition. In 2023, a new assessment was carried out to evaluate the current status of the SSSI. The SSSI was assessed against published UK attributes and targets (Common Standards Monitoring Guidance for Rivers) which identify the standards required for river special interests to be considered in favourable condition. The SSSI was assessed on the rivers and streams feature which encompasses several attributes including flow, water quality, siltation, the physical structure of the river and artificial modifications, river vegetation and invertebrates, the structure of the bankside vegetation and the abundance of invasive non-native plants. The SSSI was also assessed for the notified features Atlantic salmon (*Salmo trutta*), bullhead (*Cottus gobio*), and otter (*Lutra lutra).* A climate change risk assessment was conducted for all four features. The assessment found the Rivers and Streams and European bullhead features to be in an **unfavourable** condition, Atlantic salmon **unfavourable, declining** and otter **favourable.** Multiple pressures were identified including physical modifications such as weirs, point source and diffuse pollution. The existing data also suggests that the natural flow regime is being impacted by water company abstractions and discharges; however, it should be noted that a CSMG compliant flow report is still pending, expected to be completed by the Environment Agency in 2025. Several mechanisms have been identified to help bring the SSSI/SAC into favourable condition. These include investigative and regulatory mechanisms. Of primary importance is the need to reduce nutrient input into the catchment in order to decrease the impact of over-nutrification on the rivers and streams feature of the SSSI and the associated biodiversity it supports.

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Introduction

Natural England monitor Sites of Special Scientific Interest (SSSI)s in order to maintain up to date and accurate condition assessments. Each SSSI feature is assigned one of five following categories: **Favourable** condition indicates that the SSSI's designated features are being effectively conserved, with monitoring confirming they meet the required conservation objectives. **Unfavourable recovering** reflects situations where the features are not yet in a favourable state but are on a trajectory of improvement due to appropriate management measures being implemented. **Unfavourable - no change** describes features that are failing to improve, often due to insufficient management or ongoing external pressures, which must change to enable recovery. **Unfavourable declining** indicates a worsening condition where the features are deteriorating due to inadequate conservation efforts or escalating external threats. Finally, the **(Part) Destroyed** category signifies permanent damage to the SSSI feature, where recovery to a favourable condition is no longer possible, regardless of management interventions. If one or more of the feature's mandatory attributes do not meet their targets, then the feature is assessed as **unfavourable**. When features are assessed as unfavourable, an assessment of condition trend must then be carried out - whether the feature is recovering, no change or declining.

Summary Condition

Table 1: Summary condition of each attribute by assessment/SSSI unit. F = favourable, UN = unfavourable no change, UD = unfavourable declining

			SSSI unit						
Feature	**Designation**	**Condition**	**50**	**51**	**52**	**53**	**56**	**78**	**79**
Rivers and Streams	SSSI	Unfavourable – no change	UN	UN	UN	UN	UN	UN	UN
Bullhead (*Cottus gobio*)	SSSI	Unfavourable – no change	UN	UN	UN	UN	UN	UN	UN
Otter (*Lutra lutra*)	SSSI	Favourable	F	F	F	F	F	F	F

			SSSI unit						
Feature	**Designation**	**Condition**	**50**	**51**	**52**	**53**	**56**	**78**	**79**
S1106 Atlantic salmon (*Salmo salar)*	SAC (Special Area of Conservation)	Unfavourable, declining	UD	UD	UD	UD	UD	UD	UD
SS163 Bullhead (*Cottus gobio)*	SAC (Special Area of Conservation)	Unfavourable – no change	UN	UN	UN	UN	UN	UN	UN
S1335 Otter (*Lutra lutra*)	SAC(Special Area of Conservation)	Favourable	F	F	F	F	F	F	F

Table 2: Unit condition summary for each notified feature with reason for adverse condition. All assessments were carried out in February 2024.

Unit	Key pressures
50, Upper River Camel	Unit failed on account of water quality (elevated phosphorous), in-channel structures/modifications and flow, although the CSMG compliant flow assessment is still being finalised and these results are currently indicative only. Atlantic salmon is in an unfavourable declining condition, and bullhead unfavourable due to the impacts from these instream compliance failures. The Diffuse Water Pollution Plan (DWPP) and River Restoration Plan (RRP) should be implemented to bring the river into recovery.
51, Mid-River Camel	Unit fails due to the impact from in-channel structures/modifications and flow that, at an indicative level, is elevated above the allowable deviations. Biological Oxygen Demand (BOD) is also elevated above the target in this unit. Atlantic salmon is in an unfavourable declining condition, and bullhead unfavourable due to the impacts from these instream compliance failures. The DWPP and RRP should be implemented to bring the river into recovery. Impoundments/barriers, discharges from water company activities.

Unit	Key pressures
52, Lower River Camel	Unit fails on account of water quality (elevated phosphorous), in-channel structures/modifications and flow that, at an indicative level, is elevated above the allowable deviations. Atlantic salmon is in an unfavourable, declining condition, and bullhead unfavourable due to the impacts from these instream compliance failures. The DWPP and RRP should be implemented to bring the river into recovery. Point source pollution from water company activities, impoundments/barriers.
53 River Allen	Unit fails on account of water quality (elevated phosphorous levels) and in-channel structures/modifications. No data is available to indicate flow compliance, however a CSMG compliant flow assessment has been requested from the Environment Agency which will include modelling for the River Allen – although there are no public abstractions in this river, there are a number of wastewater treatment works which may impact flow patterns. Point source pollution from water company activities, diffuse water pollution from agricultural sources.
56 Clerkenwater Leat	Unit fails due to the impact from in-channel structures/modifications. No data is available to indicate flow compliance, however a CMSG compliant flow assessment has been requested from the Environment Agency which will include modelling for the Clerkenwater Leat. Atlantic salmon is in an unfavourable condition for this unit, however no data was available to determine the condition of bullhead. Lack of sampling to understand water quality compliance.
78 De Lank River	Unit fails due to impact from in-channel structures/modifications and flow that, at an indicative level, is elevated above the allowable deviations. BOD is also elevated above the target in this unit. In the lower half of this unit Atlantic salmon is in an unfavourable declining condition, and bullhead is unfavourable due to the impacts from these instream compliance failures – in this unit quarrying activities have blocked the pathway for upstream migration. The DWPP and RRP should be implemented to bring the river into recovery. Water abstraction, impoundments/barriers, physical modification of river channel (De Lank Quarry).
79 River Ruthern	Unit fails on account of water quality (elevated phosphorous) and in-channel structures/modifications. No data is available to indicate flow compliance, however a CSMG compliant flow assessment has been requested from the Environment Agency which will include modelling for the River Ruthern and

Unit	Key pressures
	Demelza Stream. Atlantic salmon is in an unfavourable declining condition, and bullhead unfavourable due to the impact from these instream compliance failures. The DWPP and RRP should be implemented to bring the river into recovery.

Table 3: Attribute compliance at unit level: P= pass, F = fail, IP= indicative pass, IF= indicative fail

			SSSI Unit						
Feature	**Attribute**	**Category**	**50**	**51**	**52**	**53**	**56**	**78**	**79**
Rivers & Streams	**Water Quality**	Dissolved Oxygen	P	P	P	P	P	P	P
		Biological Oxygen Demand	P	IF	IP	P	N/A	IP	IP
		Ammonia	P	P	F	P	P	P	P
		Unionised Ammonia	P	P	P	P	P	P	P
		Soluble Reactive Phosphorus	F	P	F	F	P	P	F
	Flow	Flow	IF	IF	IF	N/A	N/A	IF	N/A
	Habitat Structure	Channel Planform	P	P	F	F	F	F	F
		Habitat Modification Score (HMS)	F	F	F	F	F	F	F
		Bank Vegetation Naturalness	F	P	P	F	P	F	P
		Riparian Zone Naturalness	P	P	P	F	P	P	P
		Large Woody Debris	P	P	P	P	P	F	P
		In-Channel Structures	F	F	F	F	F	F	F
		Siltation	F	P	F	F	F	P	F
		Negative Indicators	P	P	P	P	P	P	P
	Biological Assemblages	Trophic Diatoms	IF	IF	IF	IF	N/A	IP	IF
		Macrophytes	F	F	P	F	P	P	F
		Invertebrates	F	P	P	P	P	P	P
Freshwater Fauna	**Atlantic salmon**	Juvenile Atlantic Salmon	F	F	F	F	N/A	F	F
		Adult Atlantic Salmon	F	F	F	F	N/A	F	F
	Bullhead	Bullhead	F	F	F	F	N/A	F	F
Mammals	**Otter**	Otter	P	P	P	P	P	P	P

This condition assessment has been informed by the ‘River Camel SSSI Desk Study (P00008007)’ conducted by APEM in April 2022, Environment Agency data, Stantec Options Appraisal for meeting CSMG targets measure specification, and survey work carried out by the Area Team throughout 2023.

Rivers and Streams is a monitored feature of the following River Camel Valley and Tributaries SSSI units:

- **Unit 50:** Upper River Camel (Water Framework Directive WFD: GB108049007060)
- **Unit 51:** Mid River Camel (WFD: GB108049006980)
- **Unit 52:** Lower River Camel (WFD: GB108049000190, GB530804906600)
- **Unit 53:** River Allen (WFD: GB108049007050, GB530804906600)
- **Unit 56:** Clerkenwater Leat (Included in GB108049000190 but is not included in the routine EA monitoring.)
- **Unit 78:** De Lank (WFD: GB108049007030)
- **Unit 79:** River Ruthern (WFD: Lower GB108049000050, Demelza Stream GB108049000020, Upper GB108049000060)

See Figure 1 for a map of the SSSI units, and Appendix 1 for a map of SSSI units and associated Water Framework Directive (WFD) water body.

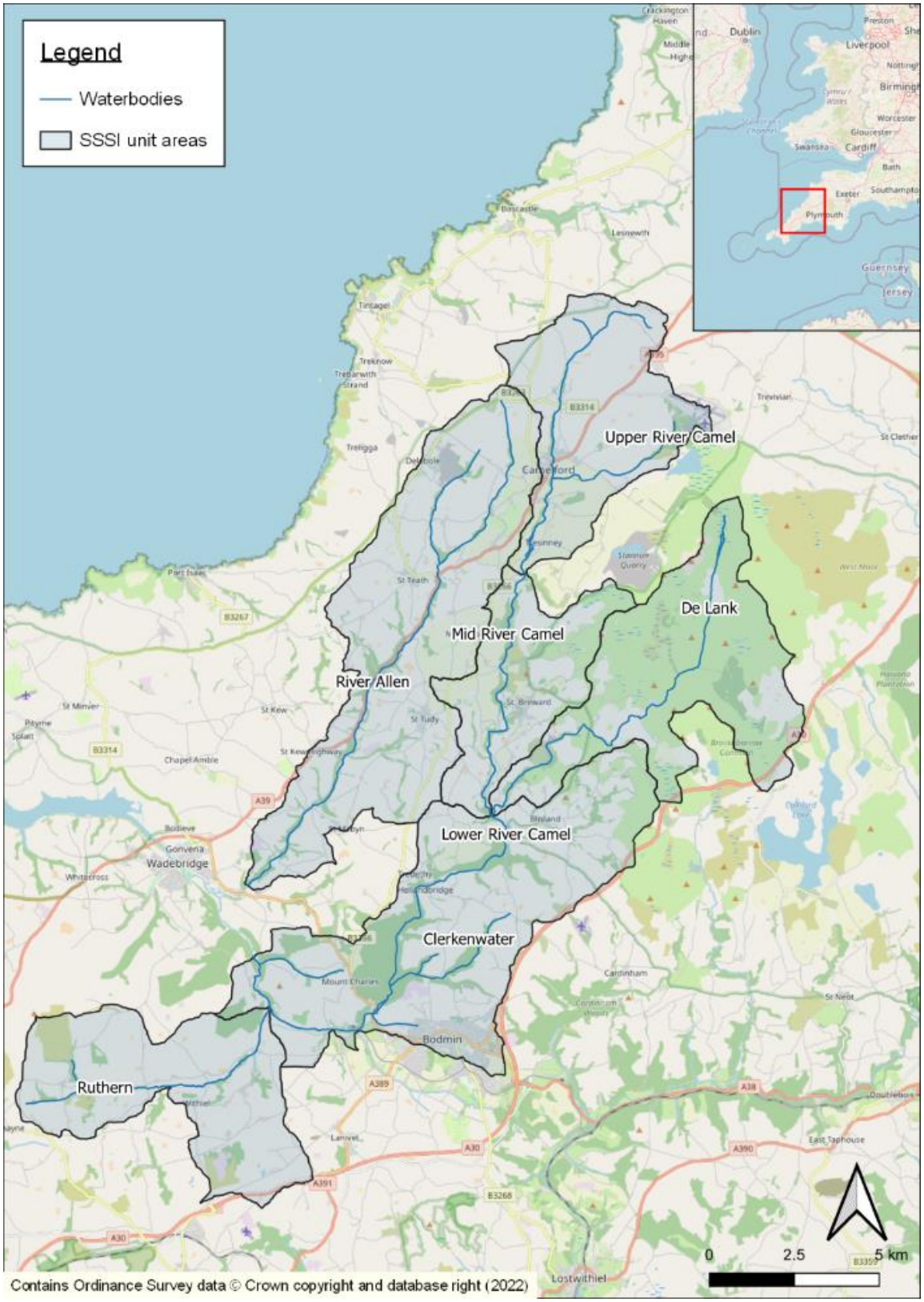


Figure 1: Map of SSSI units and associated WFD waterbody catchment (APEM, 2023)

Ecological and Geomorphological context

The River Camel (Cornish: *Dowr Kammel*, 'Curved' or 'Crooked River') rises on Hendrabruick Down (SX136875) and flows approximately 55km downstream, curving almost 90 degrees toward the north Cornish coast, before reaching the estuary near Wadebridge. The SSSI and SAC cover most of this reach, from the source to the tidal limit at Wadebridge, and include the Camel's main tributaries – the De Lank, River Allen and the River Ruthern, as well as the Demelza Stream and Clerkenwater Leat. The predominantly agricultural catchment area is approximately 413km^2.

The following summary from Grieve (2010) outlines the ecological and geomorphological features of the rivers designated under the River Camel Valley and Tributaries SSSI.

Table 4: Summary from Grieve (2010) outlining the ecological and geomorphological features of the rivers designated under the River Camel Valley and Tributaries SSSI.

Ecological context: JNCC River Type	Geomorphological context: WFD hydromorphology typology
River Camel (Units 50, 51 and 52)	
The river is Type VIII for most of its length i.e. oligo-mesotrophic river. The channels are characterised by mid-altitude, intermediate stream gradients. The substrate is dominated by gravels and pebbles. Cobbles, boulders and bedrock are common. Flow is fast and a mixture of riffles, pools and glides is present. Channel plants are predominantly bryophytes. Type VII is present in the upper reaches i.e. mesotrophic rivers dominated by gravels, pebbles and cobbles. Type IV is present in the lower reaches i.e. impoverished lowland rivers. Cobbles, boulder and bedrock are present but modifications such as barriers and impoundments lead to silty substrates. Bankside trees provide extensive shading and a source of woody debris.	Heavily Modified Water Body upstream Camelford Typically plane- bed and pool-riffle channel types Pool-riffle predominant to Bodmin; low gradient meandering type downstream of Bodmin

Ecological context: JNCC River Type	Geomorphological context: WFD hydromorphology typology
River Allen (Unit 53)	
NB no formal typology exists. The river is likely to be predominantly Type VIII and VII for most of its length. Type VII reaches tend to have shallower stream gradients and more stable flow regimes, giving rise to finer substrates including exposed gravel shoals.	Ca. 19km long Typically plane- bed and pool-riffle channel types; predominantly pool-riffle from Knightsmill to St Mabyn; low gradient meandering type downstream to Camel
De Lank River (Unit 78)	
Existing surveys indicate that the river is a mixture of Types X, IX and VII. Type IX i.e. oligotrophic, low altitude rivers communities are typical. The rivers are present on oligotrophic rock and acid waters. Type X i.e. ultra-oligotrophic river sections are dominated by bedrock and boulders. In these reaches, the gradient is gentler than is typical. A key characteristic is the abundance of vascular plants in the channel. The upper De Lank is particularly notable for abundant macrophytes.	Ca. 14.5km long Relatively gentle headwaters over Bodmin Moor; steep gradient over the Granite outcrop; lower gradient to confluence with River Camel Moor top has cascade, step-pool and plane bed types where steep; pool-riffle in lower gradient reaches
Ruthern (Unit 79)	
NB no formal typology exists. The river is likely to be predominantly Type VIII and VII for most of its length. Type VII reaches tend to have shallower stream gradients and more stable flow regimes, giving rise to finer substrates including exposed gravel shoals.	Ca. 9km long Predominantly wooded Typically plane- bed and pool-riffle channel types

Ecological context: JNCC River Type	Geomorphological context: WFD hydromorphology typology
Clerkenwater (Unit 56)	
NB no formal typology exists. The river is likely to be predominantly Type VIII and VII for most of its length. Type VII reaches tend to have shallower stream gradients and more stable **flow regimes,** giving rise to finer substrates including exposed gravel shoals.	Ca. 4.5km long Predominantly wooded Typically plane- bed and pool-riffle channel types

Historical and Stakeholder Context

Historically, the Camel has centred as a location for agriculture and industry. The moorland in the upper reaches of the catchment yield to farmland, predominantly for livestock, and woodland as the river and its tributaries continue down the valley. Principally rural, Camelford and Bodmin are the main urban centres within the SSSI, with a combined population of under 20,000 (Office for National Statistics, 2021).

Mining for metals, clay and granite have shaped the river and its riparian habitat. The Camel Trail, a popular mixed-use cycleway running adjacent the Camel from Wenford Bridge to Wadebridge, follows the route of the disused Bodmin and Wadebridge Railway, first built in 1831 to transport sand from the estuary to agricultural land within the catchment. Perhaps the most significant impact from industry lies on the De Lank River (unit 78), where tipping of quarry rubbles by De Lank Quarries forces the river to be artificially subterranean for approximately 200m. More formal impoundments, such as Dunmere Weir, are a further legacy of historic industry and are valued for their local history but provide a barrier to achieving favourable condition in the SSSI.

Today the Camel Valley is popular with both locals and tourists, the latter increasing the existing population by 49% in the summer months. The Camel is a popular angling river, the beats managed by the Camel Fisheries Association. This association, made up of the two main local clubs (Bodmin Anglers Association & Wadebridge and District Angling Association) and private riparian landowners work with the Environment Agency and Natural England to manage the riparian and in-channel habitats for trout and the designated species, Atlantic salmon.

Both public and private water abstraction occur on the River Camel and from functionally linked habitats. Within the SSSI public abstraction by South West Water

occurs at De Lank WTW (213260, 076552) and outside of the SSSI (but functionally linked to the catchment) at Stannon Lake (212400, 081034) and Crowdy Marsh, also an SAC (214758, 083529). Private abstractions on the Camel at Kenningstock (209759, 081100) and on the Allen at Hingham Mill (202070, 072460) may also have an impact on river flows.

The River Camel SSSI catchment has been in a ‘Nutrient Neutrality’ (Cornwall Council, n.d) scheme since 2021, with the following sewage treatment works (STW) discharging directly into the River Camel or its tributaries: Camelford STW, Helstone STW, St Teath STW, Delabole STW, a, Blisland STW, Wadebridge Road STW, St Mabyn STW, Bodmin Scarlett’s Well STW, and Nanstallon STW.

Section 1: Whole Feature Assessment

1a. Rivers and Streams Feature

The following provides a summary of the site condition against each attribute used to determine the condition of the Rivers and Streams feature, as outlined in JNCC Common Standards Monitoring Guidance for Rivers (JNCC, 2016):

The sources of data used to inform this assessment are as follows:

- River Camel Valley and Tributaries SSSI Desk Study (APEM, 2023)
- Options Appraisal for Meeting CSMG Targets Measure Specification (Stantec, 2023)
- WFD classification data – Catchment Data Explorer
- Diatoms, Macrophytes and Freshwater Fauna - Ecology and Fish Data Explorer
- WIMS (water quality)
- Salmon Stocks and Fisheries in England and Wales 2022
- Semi & Fully Quantitative Electric Fishing Surveys: River Camel (Westcountry Rivers Trust, 2023)
- Pollution Risk Assessment and Source Apportionment: Camel Catchment (Westcountry Rivers Ltd, 2015)

The full Monitoring Specification can be found here.

Attribute: River Habitat Structure

Compliance **- FAIL**

APEM (RHS accreditation code: CRHS036) conducted a River Habitat Survey of the River Camel SSSI between 28th February to 3rd March 2022. Upon review it was noted that one of the sites was not accessed and a further two were not within the SSSI. Additionally, due to a mislabelling, none of the survey sites were within Unit 51. A supplementary survey was carried out at two sites within Unit 51 in September 2023 by accredited Natural England staff (RHS accreditation code: DG042).

In total, 16 sites were surveyed in 2022 and 2023, accounting for approximately 8% of the River Camel SSSI. Although CSMG for Rivers stipulates that 10% of the SSSI should be surveyed to determine compliance, the 2022-2023 surveys have been considered representative of the wider river and its tributaries. A summary of the condition for each category can be found in table 4, with a thicker description and photographs of each RHS site in the APEM report.

Table 4: Summary of unit condition for habitat structure. P = pass, F = fail

	Unit Compliance						
Feature	**50**	**51**	**52**	**53**	**56**	**78**	**79**
Channel Planform	P	P	F	F	F	F	F
Habitat Modification Score	F	F	F	F	F	F	F
Bank Vegetation Naturalness	F	P	P	F	F	F	P
Riparian Zone Naturalness	P	P	P	F	P	P	P
Large Woody Debris	P	P	P	P	P	F	P
In-channel Structures	F	F	F	F	F	F	F
Siltation	F	P	F	F	F	F	F
Negative Indicators	P	P	P	P	P	P	P

Channel Planform

Target: Channel form should be generally characteristic of river type, with predominantly unmodified planform. ≤ 5% of the assessment unit should be artificial, re-aligned or constrained.

Compliance: **Fail**

Units 50, 51 complied with the target, with channel planform determined as ‘natural/unmodified’ with < 5% of the whole unit assessed as realigned. Although channel planform for all other units was determined to be ‘natural/unmodified’, each unit failed due to the presence of artificial features across <5% of the assessment unit. These artificial features consisted of bank reinforcements, resectioning and reinforcement.

Habitat Modification Score

Target: ≥65% or more of condition monitoring sites should fall within the semi-natural HMS class 1, with the remainder predominantly unmodified (class 2). No (or minimal) deterioration from the last monitoring cycle.

Compliance: **Fail**

All units failed to comply with the target for Habitat Modification. The main pressures identified as influencing compliance with this target were the presence of riverbank reinforcement, re-sectioning, weirs, bridge, deflectors, and cattle poaching (APEM, 2023)

Bank Vegetation Naturalness

Target: Mean SERCON score for the assessment unit of 4 or 5

Compliance: **Fail**

Units 50, 53 and 78 failed to meet the minimum CSMG target for Bank Vegetation Naturalness, scoring 3, 3 and 3.5 respectively. This was determined to be due to extensive improved and amenity grassland. Units 51, 52, 56 and 79 were compliant with the target, with bankside trees, and submerged and exposed roots noted as semi-continuous throughout.

Riparian Zone Naturalness

Target: Mean score for the assessment unit of 4 or 5

Compliance: **Pass**

Only unit 53 was assessed as failing to meet the compliance target, which was attributed to the presence of artificial and suburban developments, parkland and gardens, as well as improved and amenity grassland. All other units were compliant with the target.

Large Woody Debris

Target: Within each assessment unit: EITHER 75% or more RHS sites have large woody debris ‘Present’ OR 10% or more of RHS sites have large woody debris ‘Extensive’

Compliance: **Pass**

Only unit 56 failed the meet the compliance target, with no Large Woody Debris present in one of the two survey sites. The failing survey site was located above the De Lank Quarries, close to Delphi bridge, where the surrounding moorland is primarily agricultural. Whilst there are some wooded sections along the river in these upper reaches, the majority of the landscape is dominated by grassland and scrub. A greater proportion of riparian tree cover is present along the De Lank downstream of

the De Lank Quarries. It is possible that had 10% of the De Lank been surveyed, the unit would be compliant with the target. All other units met the compliance target.

In-channel Structures

Target: Throughout the assessment unit: if present, structures should have no effect (or minor effect) on migration, on sediment transport, and habitat structure. Assessments should include the upstream 'ponding' effects that artificial structures have on flow patterns and habitat structure.

Compliance: **Fail**

All units failed to comply with the target for In-channel Structures. Major and minor weirs were present within the assessment sites of units 78 and 79, as well as a major and intermediate bridge. For all other units in-channel structures were not present within the survey sites, however the natural functioning of the river system was deemed to be impacted by in-channel structures within the wider catchment.

Attribute: Fine Sediment

Siltation

Target: No unnaturally high levels of siltation as indicated by: (a) 'silting' highlighted in section P of the RHS form ('Overall characteristics – major impacts') OR (b) one-third or more of the total number of RHS spotchecks in the assessment unit have silt (SI) as the predominant channel substrate

Compliance: **Fail**

Only units 51 and 78 were compliant with the target, all other units noted unnaturally high levels of siltation. Of these sites siltation was noted at one-third or more of the spot checks. The APEM report conclude that "agricultural land use is the main pressure directly influencing sediment input into the catchment" (APEM, 2023).

Attribute: Negative Indicators

Alien species

Target: No high-impact alien species established (i.e. self-sustaining populations). Standard checklists of species are based on those used for WFD assessments 1. A site will be assessed as unfavourable when there is good evidence that any non-native species or locally absent species is causing an impact on site integrity.

Compliance: **Pass**

No self-sustaining negative indicators were noted as present, therefore all units have passed the compliance test for this attribute. It is worth noting that only two of the 16 RHS surveys were carried out close to the optimal period for surveying (May-September), with APEM conducting the remaining 14 in February-March. It would be prudent therefore, to revisit the survey sites within each unit during the May-September period to review the presence of negative indicators such as Himalayan Balsam within the riparian zone.

Attribute: Flow

Awaiting result of Environment Agency flow assessment against CSMG targets. **The following results, therefore, are to be treated as indicative only**.

Target: The natural flow regime of the river should be protected. Daily flows should be close to what would be expected in the absence of abstractions and discharges (the naturalised flow). Flow targets for WFD high ecological status should be used to avoid deterioration and for restoration where this is technically feasible. These are:

<Qn95 (low flows)	<5% deviation from daily naturalised flow
Qn50-95 (low – moderate flows)	<10% deviation from daily naturalised flow
Qn10-50 (moderate – high flows)	<10% deviation from daily naturalised flow
>Qn10 (high flows)	<10% deviation from daily naturalised flow

Compliance: **Fail**

Table 5: Comparison of APEM, Stantec and NE indication for flow compliance.

Unit	APEM	Stantec	Natural England Indication
Unit 50	Compliant	Compliant	Indicative non-compliant (elevated)
Unit 51	Non-compliant	Compliant	Indicative non-compliant
Unit 52	Non-compliant	Compliant	Indicative non-compliant
Unit 53	N/A	N/A	N/A

Unit	APEM	Stantec	Natural England Indication
Unit 56	N/A	N/A	N/A
Unit 78	Non-compliant	Non-compliant	Indicative non-compliant
Unit 79	N/A	N/A	N/A

Two reports (APEM, Stantec) were conducted to support the assessment of flow against CSMG targets for the 2024 River Camel SSSI condition assessment. Unfortunately, both reports provide insufficient evidence for Natural England to accurately, and with certainty, determine flow compliance. **The following results, therefore, are to be treated as indicative only**. It is recommended that a CSMG compliant flow assessment of the River Camel SSSI is completed within one year of this condition assessment being published.

Both APEM and Stantec determine unit 50 as compliant, however both reports incorrectly consider the impact from discharges into the River Camel. The CSMG target states that flow must not deviate <5% from daily naturalised flow at <Qn95, or <10% from daily naturalised flow at >Qn10 to Qn95. Deviation considers both flow *increase*, as well as a flow decrease. The results published by Stantec show that unit 50 fails to meet the compliance target due to flows that have been elevated above the allowable deviation limit, likely as a result of sewage treatment works discharges. The APEM report only uses data from the Camelford gauging station (Appendix 2), which is upstream of these discharges; the report therefore fails to capture the true flow compliance within the unit as a whole. It is due to the potential for flows elevated above the deviation limit that Natural England considers that unit 50 fails to meet the compliance target.

To date, flow compliance for units 53 (River Allen), 56 (Clerkenwater Leat) and 79 (River Ruthern) have never been determined as part of a condition assessment for the River Camel SSSI. There are, however, no recorded abstractions or discharges present that may impact on flow regime within these units, and the Environment Agency's data shows that all three watercourses have a hydrological regime supporting high (Catchment Data Explorer). The indication therefore would be that flow within these units would be compliant with the CSMG target, however a formal assessment should be undertaken to confirm this.

Attribute: Water Quality

Table 6 summarises the 2022 Water Framework Directive (WFD) classification for the physico-chemical attributes associated with each SSSI unit.

Table 6: The 2022 WFD classification for the physico-chemical attributes associated with each SSSI unit.

	WFD Ecological Status (2022)						
	Upper River Camel	Camel (De Lank to Stannon)	Lower River Camel	Allen	Lower River Camel	De Lank River	Lower River Ruthern
Classification Item	Unit 50	Unit 51	Unit 52	Unit 53	Unit 56	Unit 78	Unit 79
Physico-chemical quality elements	Good	Good	High	Good	High	High	High
Acid Neutralising Capacity	N/A	N/A	N/A	High	N/A	N/A	N/A
Ammonia (Phys-chem)	High	High	High	High	High	High	High
Dissolved oxygen	High	High	High	High	High	High	High
Phosphate	Good	Good	High	Good	High	High	High
Temperature	High	High	High	High	High	High	High
pH	High	High	High	High	High	High	High

Summarised from the 2023 APEM report, Table 7 summarises the compliance for water quality attributes across each unit. Results for BOD should be interpreted as indicative only – please refer to the explanation of limitations below for further clarity. Unit 78, De Lank River, is the only unit which complies with all water quality targets.

Table 7: Summary of water quality compliance as outlined in APEM 2023. P=pass, F= Fail, IP = indicative pass, IF = indicative fail

				Unit	Unit	Unit	Unit	Unit	Unit	Unit
Broad Parameter	**Detailed Parameter**	**Unit**	**Target**	**50**	**51**	**52**	**53**	**56**	**78**	**79**
Organic pollution	**10%ile Dissolved Oxygen (DO)**	**(% saturation)**	**85.00**	96 P	94 P	89 P	94 P	95 P	92 P	92 P
Organic pollution	**Mean Biological Oxygen Demand (BOD)**	**mg L -1**	**1.50**	1.4 P	1.9 IF	1.4 IP	1.3 P	N/A	1 IP	1.1 IP
Organic pollution	**90%ile Total Ammonia**	**(NH3-N, mg L-1)**	**0.25**	0.9 P	0.18 P	0.52 F	0.1 P	0.06 P	0.04 P	0.1 P
Organic pollution	**95%ile un-ionised Ammonia**	**(NH3-N, mg L-1)**	**0.021**	0.0004 P	0.0007 P	0.0009 P	0.001 P	0.0006 P	0.0002 P	0.0005 P
SRP	**Annual Mean**	**µg/L**	**10 - 40**	15.9 F	30.2 P	50.3 F	58.2 F	12.4 P	11.2 P	21.4 F

				Unit	Unit	Unit	Unit	Unit	Unit	Unit
Broad Parameter	**Detailed Parameter**	**Unit**	**Target**	**50**	**51**	**52**	**53**	**56**	**78**	**79**
SRP	**Growing season mean**	**µg/L**	**10 - 40**	16.7 F	28.5 P	64.4 F	80.3 F	10.4 P	9.3 P	24.7 F

Dissolved Oxygen

All units were compliant with the target for Dissolved Oxygen.

Biological Oxygen Demand

APEM notes that data used to determine BOD status for units 51, 52, 78 and 79 is limited to one sampling point within each unit, with the age and availability of the data an additional limiting factor – compliance for unit 51 for example has been based on BOD results from 2012 only, with units 78 and 79 based on data from 2008. No BOD data is available to support a compliance assessment of unit 56.

Ammonia

All units meet the compliance target for ammonia, with the exception of unit 52. APEM note however that it is likely that the elevated readings were due to a localised pollution incident, and not indicative of the unit as a whole –

“Concentrations varied between sampling points in Unit 51 and Unit 52. In Unit 51, four of the five sampling points had very low concentrations indicative of High WFD status, while one had intermittent elevated concentrations, with the percentile value indicative of Poor status (sampling point SW-82539999). Similarly, in Unit 52, two of the three sampling points had very low concentrations indicative of High WFD status, while one (SW-82549999) had a percentile value indicative of Poor status. It is noted that in both instances the sampling point with intermittent elevated concentrations was only ever sampled in response to pollution incidents when such levels are expected.” (APEM, 2023)

The report goes on to advise that when the pollution incident data is removed from the assessment, all units are indicative of high WFD status and are compliant with the CSMG target.

SRP

Table 8 details unit compliance with the site-specific targets for SRP, as set out in the monitoring specification. Targets are applied as a growing season (March – September) mean and a whole year mean.

Table 8: Compliance with site-specific targets for Soluble Reactive Phosphorus (SRP), as outlined in the Monitoring Specification

	Unit 50 Above Gam Bridge	Unit 50 Below Gam Bridge	Unit 51	Unit 52	Unit 53 Sladesbridge	Unit 53 All other sampling points	Unit 56	Unit 78	Unit 79
Target SRP in µg/L	10	20	40	40	30	20	15	15	20
Compliance with target – Pass/Fail	F	P	P	F	F	F	P	P	F

Units 51, 56 and 78 are compliant with the target for SRP as outlined in the monitoring specification. All other units failed to meet the compliance requirements and are therefore present unfavourable water quality in terms of SRP. The highest SRP concentrations were found in the River Allen (unit 53); APEM note that SRP was elevated across all sample points, therefore this failure is likely indicative of compliance across the unit as a whole.

Other Pollutants

Target: *“Good Chemical Status according to the WFD”*

Compliance: **FAIL**

Excerpt from APEM, 2023 – “All water bodies failed to achieve Good chemical status due to PDBE and mercury and its compounds. Chemical status is assessed by monitoring up to 52 different chemical elements (individual and groups of chemicals). For the most recent classification (2019), new assessments for ubiquitous, persistent, bioaccumulative and toxic substances (uPBTs) were included, as well as new standards, improved techniques and methods. As a result, nationally, none of the surface water bodies met the criteria for achieving ‘Good’ Chemical status in 2019, compared to 97% in 2016 (Environment Agency, 2020). Excluding the new assessments for uPBTs, only 6.2% of surface waterbodies fail.” As of 2024, the WFD objective to improve all waterbodies from Failing to Good ecological status is **2063**.

Attribute: Biological Assemblages

Table 9 summarises the Environment Agency's 2022 data classification for biological attributes.

Table 9: Summary of 2022 WFD status for biological attributes within River Camel SSSI

	WFD Ecological Status (2022)						
	Upper River Camel	**Camel (De Lank to Stannon)**	**Lower River Camel**	**Allen**	**Lower River Camel**	**De Lank River**	**Lower River Ruthern**
Classification	**Unit 50**	**Unit 51**	**Unit 52**	**Unit 53**	**Unit 56**	**Unit 78**	**Unit 79**
Ecological	Good	Good	Good	Moderate	Good	Good	Good
Biological Quality Elements	Good	Good	Good	Moderate	Good	Good	Good
Fish	Good	High	High	Good	High	Good	Good
Invertebrates	Good	High	High	High	High	High	High
Macrophytes and Phytobenthos Combined	Good	Good	Good	Moderate	Good	High	Good
Macrophytes Sub Elements	Good	Good	High	N/A	High	High	N/A
Pytobenthos Sub Elements	Good	Good	Good	Moderate	Good	High	Good

Diatoms

Target: “The target using the Trophic Diatom Index (TDI) Ecological Quality Ratio should be a normalised EQR of ≥ 0.8, equivalent to high ecological status (WFD-UKTAG, 2014a).”

Compliance: **Fail**

The APEM report provides an assessment of Environment Agency data from 2018 and 2019. The table below, adapted from the APEM report, presents a summary of DARLEQ results for each SSSI unit. This assessment of compliance should be treated as **indicative only**, as explained by APEM – “The UKTAG methodology document recommends that six diatom samples collected over three years are used to produce a classification. Fewer can be used but will result in a reduced confidence in class. The number of samples for sites in this study ranged from one to four so resultant classifications and do not meet the criteria for a SSSI Condition Assessment (EQR = ≥ 0.8) which is equivalent to high ecological status regarding WFD, and therefore should be used as indicative only.” (APEM, 2023)

Whilst the available diatom data was limited, the results indicated that eutrophication was evident in both the River Camel and River Ruthern. Comparatively, the Unit 78 (De Lank) and Unit 53 (River Allen) appeared less impacted by nutrient enrichment, with only Unit 78 (De Lank) complying with the target of high ecological status. The TDI compliant result for Unit 53 (River Allen) is in contrast to the unit’s phosphorus result. No diatom samples were available at the time of the APEM study for the Unit 56 (Clerkenwater Leat).

Upon review of the available data for this report however, it was noted that the WFD classification for the River Allen was Moderate, and indeed has been classed as such since 2013. Additionally, the Allen is the only WFD waterbody in the Camel catchment to have an RNAG action specifically relating to its phytobenthos result. Whilst the difference between the APEM report and published WFD classification does not change overall compliance with the CSMG target, it is important to raise the discrepancy to ensure pressures within the SSSI are appropriately recorded. In addition to according more readily with the SRP result for the Allen, this long-term moderate status would accord with previous studies within the Camel catchment which showed diffuse pollution from agriculture to be a notable pressure within Unit 53. Unit compliance with the target for diatoms can be found in Table 10.

Table 10: Unit compliance for Diatoms for APEM report and from WFD classifications

SSSI Unit	WFD Waterbody	APEM Classification	WFD Status 2020	WFD Status 2021	WFD Status 2022	Target Compliance Pass/Fail
50	Upper River Camel	Moderate	Good	Good	Good	F
51	Camel (De Lank to Stannon)	Moderate	Good	Good	Good	F
52	Lower River Camel	Moderate	Good	Good	Good	F
53	River Allen	Good	Moderate	Moderate	Moderate	F
56	Lower River Camel	-	-	-	-	-
78	De Lank	High	High	High	High	P
79	River Ruthern	Moderate	Good	Good	Good	F

Macroinvertebrates

Target: **"**WHPT tool should give a result of high ecological status for the assessment unit"

Compliance: **FAIL**

Table 11: Macroinvertebrate compliance per unit

Unit	50	51	52	53	56	78	79
WFD Status	Good	High	High	High	High	High	High
Unit Compliance Pass/Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass

Table 11 demonstrates unit compliance against the 2022 WFD classification for Invertebrates. All but one unit achieved High Ecological Status for macroinvertebrates, with Unit 50 (Upper Camel) achieving 'Good' and therefore failing to reach the compliance target.

Attribute: Direct Human Disturbance

Weed Cutting

Target: "Any weed-cutting operations should be undertaken to leave at least 50% by area and river length of in-channel and marginal vegetation in the river uncut, to support characteristic biota (in terms of cover, food supply and spawning substrate). Weed-cutting should not interfere with the ability of the river channel to downsize through encroachment of marginal vegetation during the summer flow recession. For units occupied by juvenile salmon, weed cutting should not interfere with the provision of juvenile habitat in river types supporting submerged vascular plants."

Compliance: **PASS**

Note on compliance: As noted in the Monitoring Specification, weed cutting is not known to be a management action on the River Camel or its tributaries. Where weed cutting is carried out it is done so with appropriate assent/consent. The Environment Agency and Natural England have worked with experienced local angling groups to ensure any weed cutting is carried out sensitively, outside of key spawning and migration seasons, and retains important habitat features such as large woody debris.

1b. Freshwater Fish

The River Camel Valley and Tributaries SSSI is designated for both Bullhead (*Cottus gobbio*) and, as a feature of the River Camel SAC dependant on favourable river habitat, Atlantic Salmon (S*almo salar)*. APEM (2023) carried out a desk study to determine the favourable condition status of both species, the outcome of which is summarised in table 12. No data was available to determine the condition of Unit 56 (Clerkenwater Leat). Please refer to the APEM (2023) report for more detailed analysis and data sources.

Table 12: Summary of unit compliance for freshwater fauna targets (data from APEM 2023) F = fail.

	Unit Compliance - Pass/Fail						
Feature	**50**	**51**	**52**	**53**	**56**	**78**	**79**
Juvenile Atlantic Salmon	F	F	F	F	N/A	F	F
Adult Atlantic Salmon	F	F	F	F	F	F	F
Bullhead	F	F	F	F	N/A	F	F

Atlantic Salmon

Targets: The River Camel SSSI Monitoring Specification stipulates that:

- The spatial extent of the population should reflect distribution under near-natural conditions,
- Juvenile population density should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality, and,
- The salmon stock should meet or exceed the conservation limit of 176 eggs/100m2 of accessible wetted area (56ha), which equates to 0.98 million eggs, in at least four out of the five preceding years.

Compliance: **FAIL**

Juvenile Atlantic salmon

In the APEM report, only the following 6 of the 22 survey sites were classed as favourable in terms of population density for juvenile salmon:

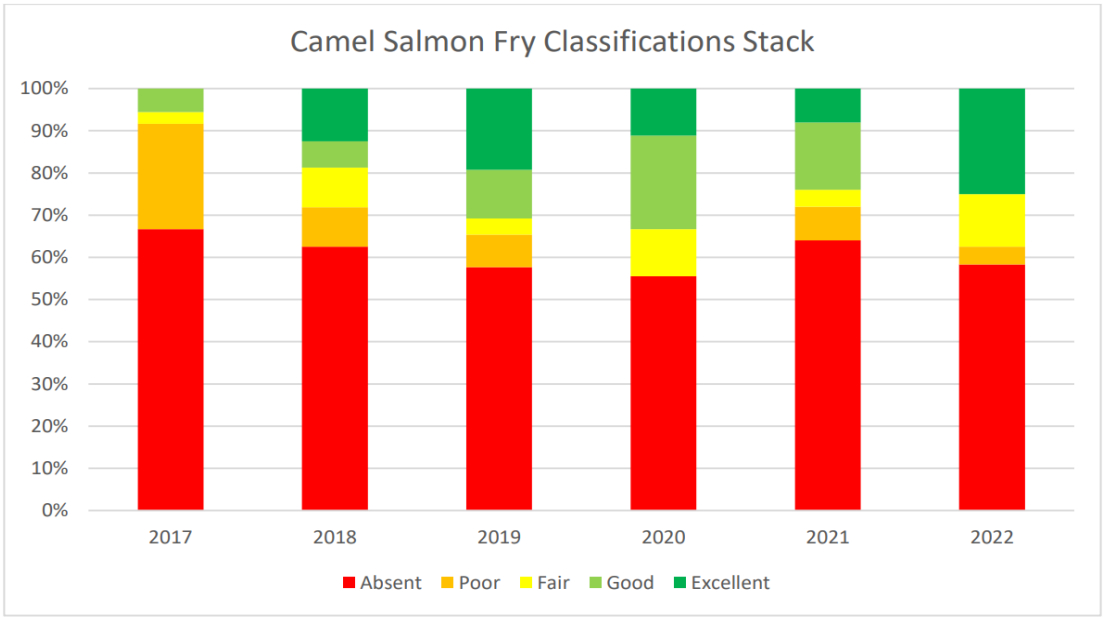
- Unit 50 - Upper River Camel – Pencarrow and d/s Kenningstock Weir
- Unit 52 - Lower River Camel – Waterland
- Unit 53 - River Allen – Treforda and Lamellan
- Unit 79 - Ruthern – Withiel

The West Country Rivers Trust (WRT) 2022 electric fishing report for the River Camel adds further and more contemporary data to this analysis. Figure 2 from this report shows an increase in the number of ‘Excellent’ classifications (Excellent = a quantity of fry at survey location >23), with figure 3 demonstrating that this was predominantly in main River Camel units 50 and 51 (See appendix 3 for a spatial depiction of the 2022 distribution). The furthest upstream location of salmon recruitment was recorded at Trekeek and Worthyvale. The increase in ‘excellent’ classifications within the upper and mid reaches of the River Camel may be symptomatic of the increased upstream adult migration to spawning habitat that has been enabled by WRT’s ‘Water 4 Growth’ project. It is hoped that this increase in fry will also be seen in Unit 79 (River Ruthern), where WRT has completed further barrier removal. WRT carried out barrier removal at Worthyvale in the summer of 2023, aimed at improving freshwater fauna access further upstream.

No data was available for upstream of Keybridge weir in Unit 78 (De Lank) due to a heavy rainfall event that occurred during data collection. WRT note that whilst no formal evidence can be presented, salmon fry were caught prior to the deluge. Further upstream, the De Lank Quarry not only poses a complete upstream barrier to fish migration but additionally prevents transportation of the gravels necessary for habitat formation downstream of the impediment. In 2022 WRT carried out gravel augmentation downstream of Keybridge Weir, aiming to increase habitat suitability

for freshwater fauna – it will be worthwhile revisiting the electro-fishing results in the coming years to understand the effectiveness of this approach.

Salmon fry were recorded as absent for Unit 53 (River Allen) however trout fry were located. This demonstrates that suitable habitat is available, and it is hoped that salmon reestablish following the barrier easement works completed by WRT beyond Trewen.



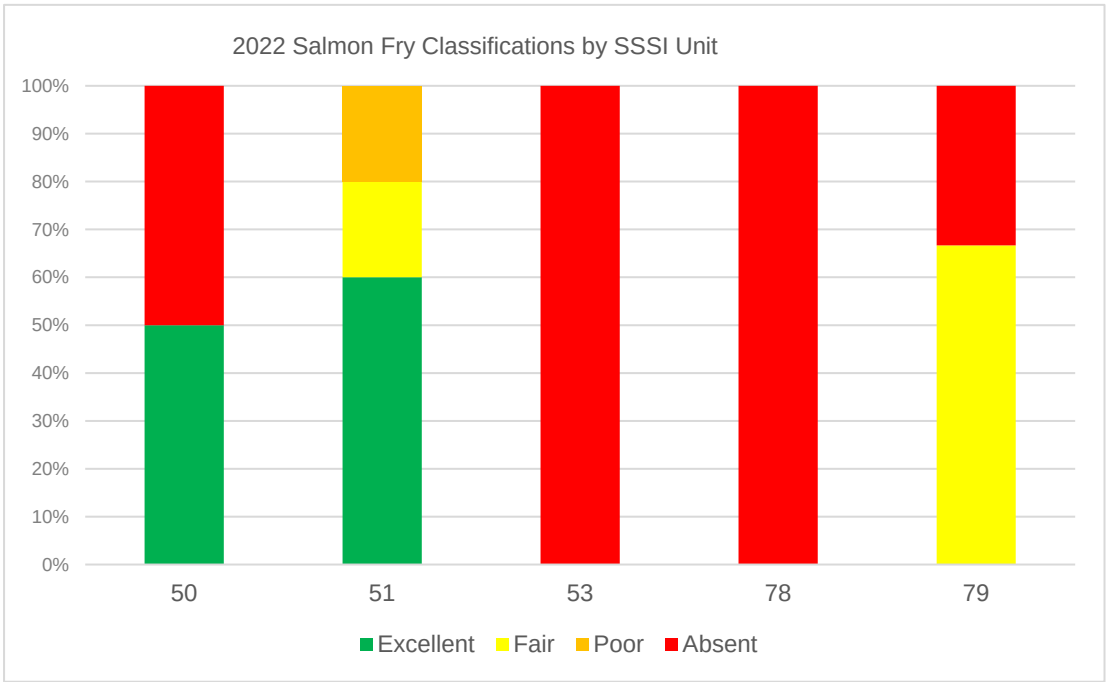


Figure 2 (top): 2017- 2022 electrofishing salmon fry classifications (WRT, 2023) & Figure 3 (bottom): - 2022 salmon fry classifications by SSSI unit distribution

Adult Atlantic salmon

The River Camel has failed to meet its conservation limit since 2017, with less than 50% of the limit being achieved in 2019 and 2021 (figure 4). Whilst the percentage increased on previous years to 58% in 2022, the Camel is still projected to be 'At Risk' of failing to achieve 2027 management objective targets (Salmon Stocks and Fisheries, 2022). The decline in percentage of conservation limit achieved is indicative of the trend across South-West England, where other SSSI/SAC rivers such as the Axe have not attained their conservation limit at all between 2010-2020 (Environment Agency, 2022). It is notable however, that of these rivers, the River Camel has seen the greatest decline in the percentage of conservation limit achieved since 2010.

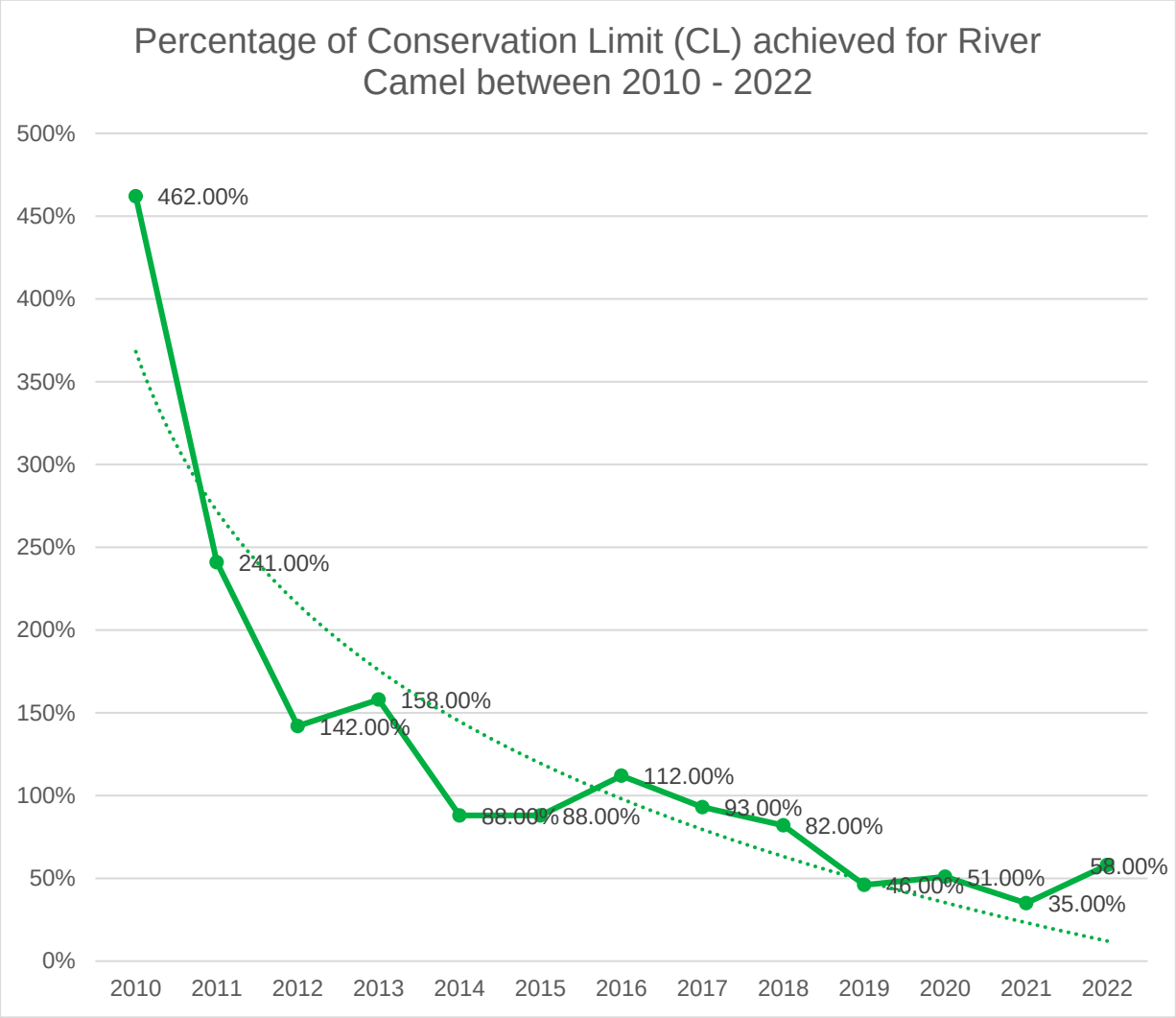


Figure 4: Graph showing decline in percentage of conservation limit achieved for River Camel between 2010 and 2022, data from 'Salmon Stocks and Fisheries in England and Wales in 2022'

The evidence, therefore, demonstrates that the River Camel SAC feature Atlantic Salmon *(Salmo salar)* is in an **'Unfavourable – Declining'** condition. The following extract from the APEM report summarises the pressures facing Atlantic Salmon that have contributed to this decline:

"Whilst a barrier assessment has not been conducted for the purposes of this report, a review of available barrier information provided by the AMBER Barrier Tracker (AMBER, 2020) indicates the presence of numerous barriers on the River Camel, throughout both the Lower and Upper River Camel waterbodies. Depending on the presence of appropriate fish passage solutions, these barriers may represent impassable structures to migrating Atlantic salmon, which may reduce their access to suitable spawning grounds, thereby reducing the rate of egg deposition within the river catchment. Water chemistry and habitat data reviewed within this report indicate that there may be physical and chemical pressures negatively impacting Atlantic salmon populations within the River Camel catchment. The Upper River Camel is considered to provide unfavourable dissolved oxygen concentrations, the Mid River Camel is considered to provide unfavourable BOD levels, and the Lower River Camel is considered to provide unfavourable ammonia levels, whilst all three sections provide unfavourable SRP levels. Furthermore, the Upper and Lower River Camel also provide unfavourable levels of siltation. These findings suggest that there are numerous physical and chemical stressors which may be negatively affecting Atlantic salmon populations within the catchment and may be contributing locally to the failure of the River Camel to achieve either its CL or MO during recent years" (APEM, 2023)

Bullhead

Targets: The River Camel SSSI Monitoring Specification stipulates that:

- Bullhead should be present in naturally suitable habitat throughout the designated site. As a minimum, no decline in distribution from current,
- There should be no reduction in population densities from existing levels, and in any case no less than 0.2 m-2 in upland rivers (source altitude >100m), and,
- There is evidence of recent recruitment in each assessment unit.

Compliance: **FAIL**

- Bullhead were found in all units other than Unit 56 (Clerkenwater Leat), demonstrating that the presence and distribution component of the target has been met. No data was available to support a study of presence in Unit 56 (Clerkenwater Leat).
- Population densities for Bullhead were found to be equal to or exceeding the compliance target of 0.2 m^{-2} at only 5 of the 24 sample sites – two in Unit 50

(Upper River Camel), and three in Unit 53 (River Allen). Units 51, 52, 78 and 79 have therefore **failed** to meet the compliance target, whilst units 50 and 53 only partially met the target.

- Favourable numbers of juvenile Bullhead were located in 14 sample locations across units 50, 51, 52, 53 and 79, partially meeting the requirements for favourable condition. Unit 78 (De Lank) failed to meet the compliance target. Again, there was no data available to support a study of Unit 56.

Section 1c. Mammals

Otter

Site Specific Target**:** Otters present on SSSI. Population maintained or increasing.

Compliance = PASS

A survey was conducted by the Natural England Devon, Cornwall and Isles of Scilly Freshwater team in winter 2023 (25th January, 1st and 8th February) The survey methodology was conducted according to CSMG for Mammals (JNCC, 2004). A more detailed description of the type of presence recorded located in appendix 4 of this report.

Images 5 and 6 were taken during the 2023 survey and are indicative of the otter sign recorded across all units of the SSSI. Otter sign was recorded present at 22 of the 25 survey sites across the River Camel SSSI (88% presence) and was recorded as present within all assessment units (table 13).

Table 13: Compliance for each SSSI unit for otter attribute. P = pass.

Unit	50	51	52	53	56	78	79
Compliance Pass/Fail	P	P	P	P	P	P	P

Figures 5, 6 showing otter print in unit 51 and spraint

Section 2 - Climate Change Risk Assessment

Climate change predictions for the Southwest of England under current climate change scenarios:

- Increase in annual mean temperature of 2.8°C (1.5 - 4.2°C).
- Increase in winter mean temperature of 2.4°C (0.8 - 4.2°C).
- Increase in summer mean temperature of 3.9°C (1.9 - 6.1°C).
- Increase in summer mean daily maximum temperature of 4.3°C (2.0 - 7.1°C).
- Change in annual mean precipitation of 2%; (-7 - +11%).
- Change in winter mean precipitation of 19% (-3% - +45%).
- Change in summer mean precipitation of -32% (-60 - -1%).

2a. Rivers and Streams

Climate change risk **= 3 MEDIUM**

The Rivers and Streams feature of the River Camel Valley and Tributaries SSSI faces several risks due to climate change. Rising temperatures are expected to exacerbate nutrient enrichment, creating optimal conditions for algal blooms and oxygen depletion, particularly during dry summers. Increased storm frequency and wetter winters are likely to destabilise riverbanks, increasing erosion and sedimentation within the river channel. These extreme weather patterns will also cause increases in the intensity of runoff from surrounding agricultural land, urban areas and conifer plantations, loading more nutrients, sediments and other pollutants such as heavy metals into the system.

Increases in extreme weather conditions such as prolonged periods of dry weather followed by intense rainfall are likely to exacerbate peat degradation on Bodmin moor, causing water quality degradation due to nutrient and sediment loading. Storm events also mean the likelihood of combined sewage overflows (CSOs) discharging untreated effluent into the river increases, of which there are 31 CSOs across the Camel catchment. Additionally, climate change can cause shifts in species' climatic envelopes, facilitating the spread of invasive non-native species (INNS) which pose a growing threat to freshwater ecosystems.

Despite these challenges, the River Camel may be slightly more resilient to climate change than other Southwesterly catchments due to the relatively high amount of wooded riparian habitat. Woodland habitat/trees provide defence against many of the above threats by regulating water temperature, attenuating runoff and stabilising riverbanks. Despite this natural resilience, the combination of these pressures places rivers and streams in the medium risk category, as the cumulative effects could significantly disrupt ecological balance.

2b. Bullhead (*Cottus gobio*)

Climate change risk = 3 MEDIUM

While the specific impacts of climate change on bullhead populations remain poorly understood, the species' reliance on stable flow regimes and habitat conditions makes it susceptible to these environmental changes. Extreme weather events, such as prolonged low flows and intense spates, are expected to stress bullhead populations. Low flows combined with higher temperatures may lead to reduced dissolved oxygen levels in shallow waters, which may even cause fish kills in severe circumstances. Bullhead spawning relies on coarse clean gravel beds, and increased sediment deposition due to erosion during extreme weather events will degrade this key habitat. Barriers such as weirs and dams are a complete obstacle

to bullhead, which have poor swimming capabilities. Bullhead are likely to be affected by the combined effect of climate change and barriers as individuals will be unable to migrate in-river to find alternative habitat. Juvenile bullheads, which depend on macrophytes for shelter, are also at risk due to the increased washout of aquatic vegetation during floods.

It is difficult to classify the impacts of climate change on bullhead, however it is possible that their thermal tolerance will not render them as vulnerable as salmonids to changes in thermal regime. Additionally, the river Camel has a high degree of naturalness for much of its riparian zone, which will provide some refuge from climate extremes and other impacts. As a result, the bullhead is classified as medium risk.

2c. Otter (*Lutra lutra*)

Climate change risk = 3 MEDIUM

Otters are resilient and adaptive predators with a strong, stable presence across the Camel catchment. However, the current climate change predictions may present significant challenges to their survival in the future. Rising temperatures and altered river dynamics could affect the availability of fish, a key food source for otters. Increased storm frequency and more frequent flooding events could also lead to the destruction of holts, reducing the availability of secure habitats for rest and reproduction.

While otters are more adaptable than some species, their reliance on stable food supplies and safe habitats places them in the medium risk category. Climate-driven changes to river ecosystems are likely to have a direct impact on otter populations under future climate change scenarios.

2d. Atlantic salmon (*Salmo salar*)

Climate change risk = 4 HIGH

Atlantic Salmon are particularly vulnerable to the impacts of climate change due to their complex lifecycle and reliance on environmental cues for key life stages. Atlantic salmon face a range of threats, with populations across the Southwest already seeing extreme declines in adult return rates, and the Camel is no exception. The main impacts to Atlantic salmon from climate change are rising temperatures and changes to the hydrological regime. Spawning is triggered by temperature, aligning with the long-held adage that salmon begin to spawn after the first frost of winter. Increasing temperatures mean that spawning may be occurring later in the year, resulting in a cascade of phenological and environmental mismatches. Once the female salmon has created a redd (nest in gravel) for the fertilized eggs, the rate

of ova development is water temperature dependant, with the incubation period taking approximately 38 days in water of 7.5°C (Lightfoot and Solomon, 2008). Changing spawning times or changes in spring temperatures mean there will be less certainty around egg development and hatching success. If extreme flooding events occur during this time or once the salmon emerge as alevins, there is an increased chance of 'washout' occurring, whereby the young of the year get washed away from their spawning location and survival rates drop. After one to three years, salmon undergo smoltification which adapts them to the marine phase of their life cycle. Smolts migrate downstream, through the estuarine environment and out to sea where they feed and grow exponentially. There is evidence that warming temperatures are causing smolts to migrate to sea earlier each year, causing predator-prey mismatches and leading to higher mortality rates in the marine phase of the lifecycle. Dryer summers also exert high stress on salmon within the freshwater environment due to their reliance on cool, well-oxygenated waters.

The issue of in-river barriers to migration is also expected to intensify, as drought or excessive flow conditions further decrease the likelihood of individuals being able to traverse them and access upstream spawning habitat. Despite the River Camel's wooded catchment providing fish refuges through the provision of woody debris, the cumulative effects of temperature stress, hydrological changes, and habitat degradation highlight the severe risks facing this species. Atlantic salmon in the River Camel are already severely threatened with numbers extremely low, however climate change is likely to be exacerbating the effect of these threats and is only likely to worsen over time, putting this feature in the high-risk category.

Section 3 - Pressures

A summary of pressures impacting on the ability of the River Camel SSSI to achieve favourable condition are noted below. These pressures, along with the mechanisms and actions by which they can be alleviated can be found on the Designated Sites View page for the SSSI.

Barriers

There are several in-channel structures within the SSSI which should be removed to restore the natural functioning of the river. Southwest Water have recently concluded an AMP7 investigation into the feasibility of removing their weir on the De Lank river. Whilst the outcome of this investigation supported the removal of the abstraction weir, the accompanying Environment Agency gauging weir will remain in-situ, itself a barrier to achieving favourable condition.

During its implementation from 2016-2022, Westcountry Rivers Trust Water for Growth (W4G) project delivered barrier removal across the SSSI, helping to improve passability for fish and restore natural processes. Natural England should continue offer advice and support to any legacy W4G projects to further barrier removal and improve downstream habitat for freshwater fauna. Natural England and the Environment Agency should continue to support Westcountry Rivers Trust in the sensitive removal of Dunmere Weir.

In their draft Water Resources Management Plan 2024, Southwest Water outlined their proposal to install a new abstraction on the River Camel at Nanastallon - a proposal which includes the installation of a new weir. Whilst this supply option was removed from their 'Preferred Plan' in later draft editions, it remains within the plan as an option. Natural England would consider a new weir to have a negative impact on the SSSI, potentially leading to further deterioration of the overall condition of the designated site and further undermining the achievement of the conservation objectives of the SAC. This further highlights the need to have accurate data from a robust CSMG flow compliance assessment, in order to evidence any potential objection to these proposals in the future.

Point source pollution

Water quality analysis has determined that the Rivers and Streams feature of the River Camel SSSI has failed to comply with the site-specific target for soluble reactive phosphorus. Elevated phosphorus can stimulate expansive algal growth, reducing the dissolved oxygen availability within the river for fish and other in-river species. This is termed 'eutrophication'. In freshwater environments, excessive phosphorus is the leading cause of eutrophication. Additionally, excessive algal growth can reduce the suitability of channel substrate for spawning salmonids by inhibiting water flow and oxygen availability for developing eggs. WRT's 2015 source apportionment report determined that point source discharges were having the greatest impact within Unit 52 (Lower River Camel) and Unit 53 (River Allen).

A Nutrient Neutrality strategic solution is in place for the River Camel SSSI and is administered by Cornwall Council. The following treatment works are required to improve nutrient discharge standards to the Technically Achievable Limit (TAL) for phosphorus (0.25mg/l) under the Levelling Up and Regeneration Act: Nanastallon, Scarlett's Well (Bodmin), Camelford and Delabole. As part of the Price Review process, Southwest Water are tasked with achieving the same phosphorus limit at St Mabyn and St Teath, and 4mg/L at St Breward.

Whilst the above investigations and improvements aim to tackle nutrient enrichment from treated effluent, the pressure from untreated effluent must also be considered in terms of point source pollution. Southwest Water's Drainage and Wastewater Management Plan (Southwest Water, 2022) class St Teath STW and Delabole STW

as carrying an ‘Immediate High Risk’ in storm overflow performance, with Nanstallon STW classed as ‘Immediate Moderate Risk’. The majority of STWs within the Camel SSSI are also categorised as being at ‘Immediate Moderate Risk’ for sewer flooding in both a 1 in 10 and 1 in 50-year storm event. Data in The Rivers Trusts’ ‘State of Our Rivers Report 2024’ (The Rivers Trust) showed that in 2022 the most frequent spillages of untreated sewage within the Camel catchment were from Delabole WWTW and St Teath WWTW, both situated in unit 53, the River Allen.

Diffuse pollution

WRT’s 2015 source apportionment report identified diffuse sources as the primary contributor of phosphorus and suspended sediments in units 50, 51, 52, 78 and 79. A Diffuse Water Pollution Plan has been agreed for the River Camel and should be implemented to manage the impact from agricultural run off on water quality. The Environment Agency are responsible for permitting waste spreading within the catchment. The impact from waste spreading operations should be evaluated to understand its contribution to diffuse water pollution within the Camel and its tributaries. The Farming Rules for Water should also continue to be enforced by the Environment Agency through farm visits and compliance checks.

Management at tidal limit

In 2023 there was a breach of the historic flood banks at the boundary of the SSSI, at the tidal limit of the Camel at Wadebridge. The land at this location is managed as part of a Higher Tier Countryside Stewardship Agreement which is due to end in 2026. As part of this agreement the land is managed via a series of tidal ingress and egress pipes which allow for flooding during spring tides. Although the landowner has now restored the flood bank, it is anticipated that due to climate change and sea level rise, these breaches will occur with increasing regularity. With the Stewardship agreement coming to an end there is an opportunity for the Environment Agency, landowner and Natural England to engage to discuss what options there are for future management or retention of this flood defence.

Water Abstraction/Water Level Changes

Natural England have commissioned a CSMG compliant flow assessment from the Environment Agency, due to be finalised in 2025. The current data indicates that abstraction is an issue across the catchment, specifically in units 51, 52 and 78. The current data also indicates that there are artificial changes to the water level from Sewage Treatment Works (STWs) causing elevated flows in unit 50. Abstraction/discharges within the catchment will be regulated through the Price Review (PR) process and the Water Resource Management Plans (WRMPs).

Key pressures in each unit

Unit 50: Diffuse water pollution from agricultural sources.

Unit 51: Impoundments/barriers, discharges from water company activities.

Unit 52: Point source pollution from water company activities, impoundments/barriers.

Unit 53: Point source pollution from water company activities, diffuse water pollution from agricultural sources.

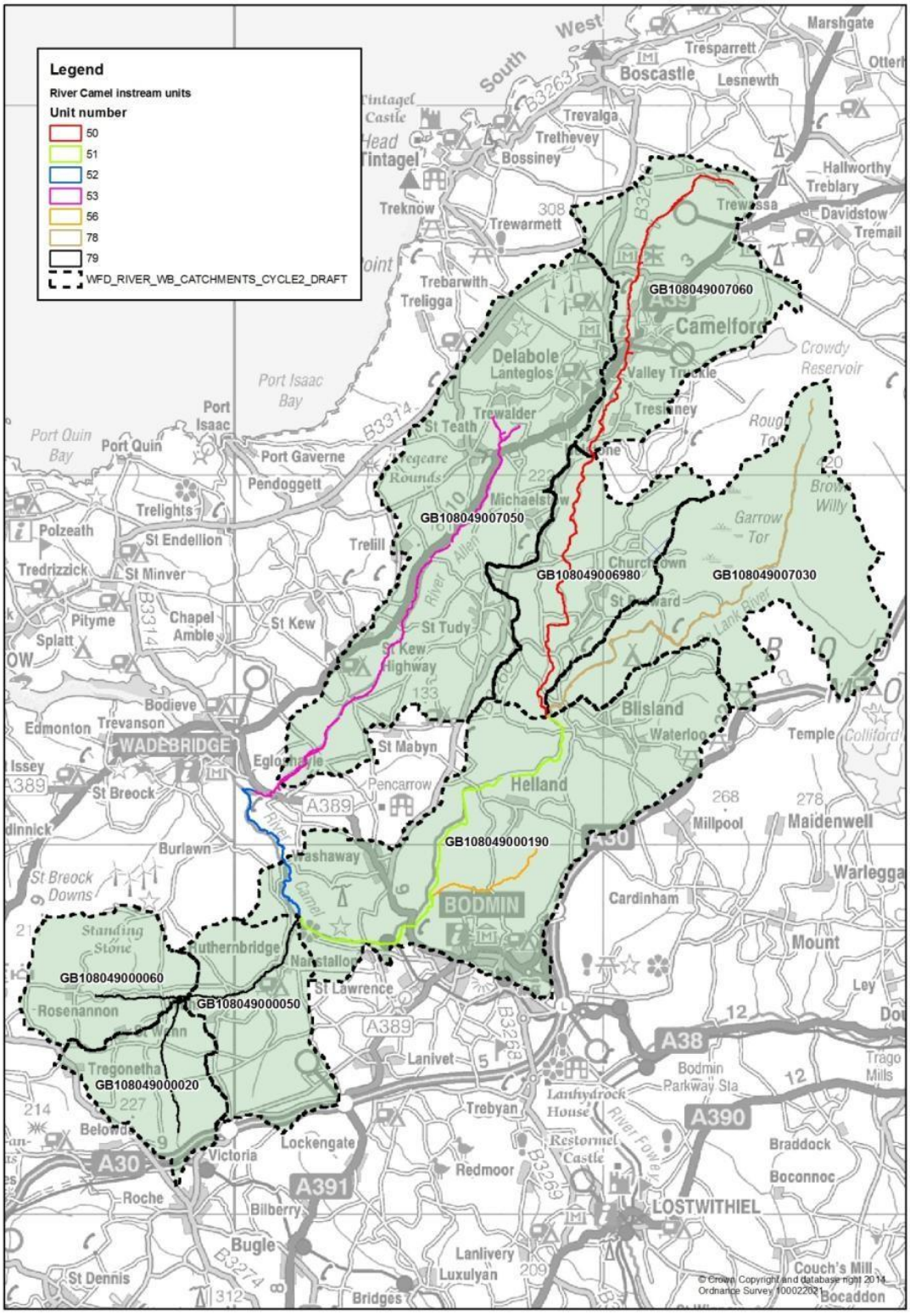
Unit 56: Lack of sampling to understand water quality compliance.

Unit 78: Water abstraction, impoundments/barriers, physical modification of river channel (De Lank Quarry).

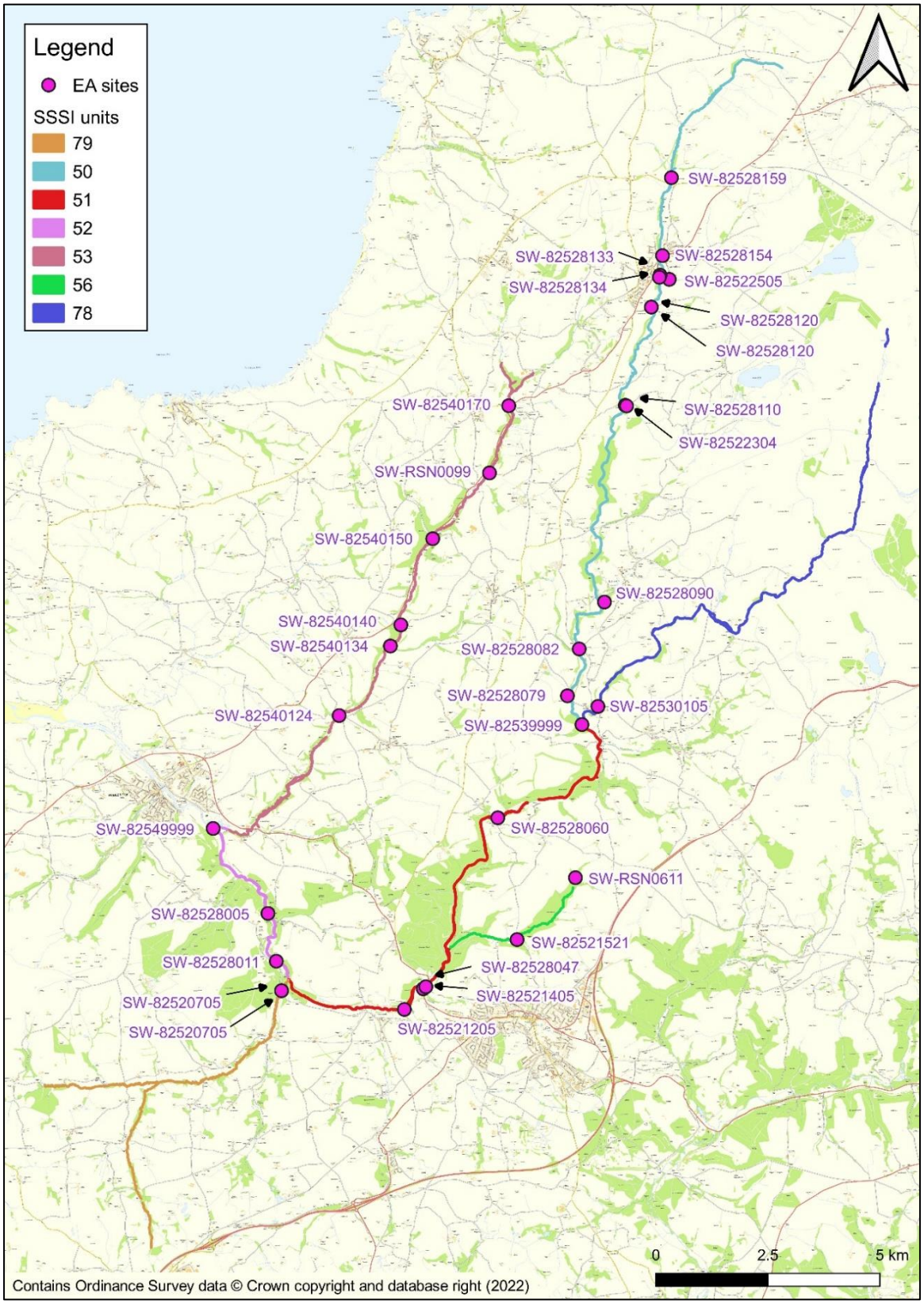
Unit 79: Diffuse water pollution from agricultural sources, impoundments/barriers.

Appendix

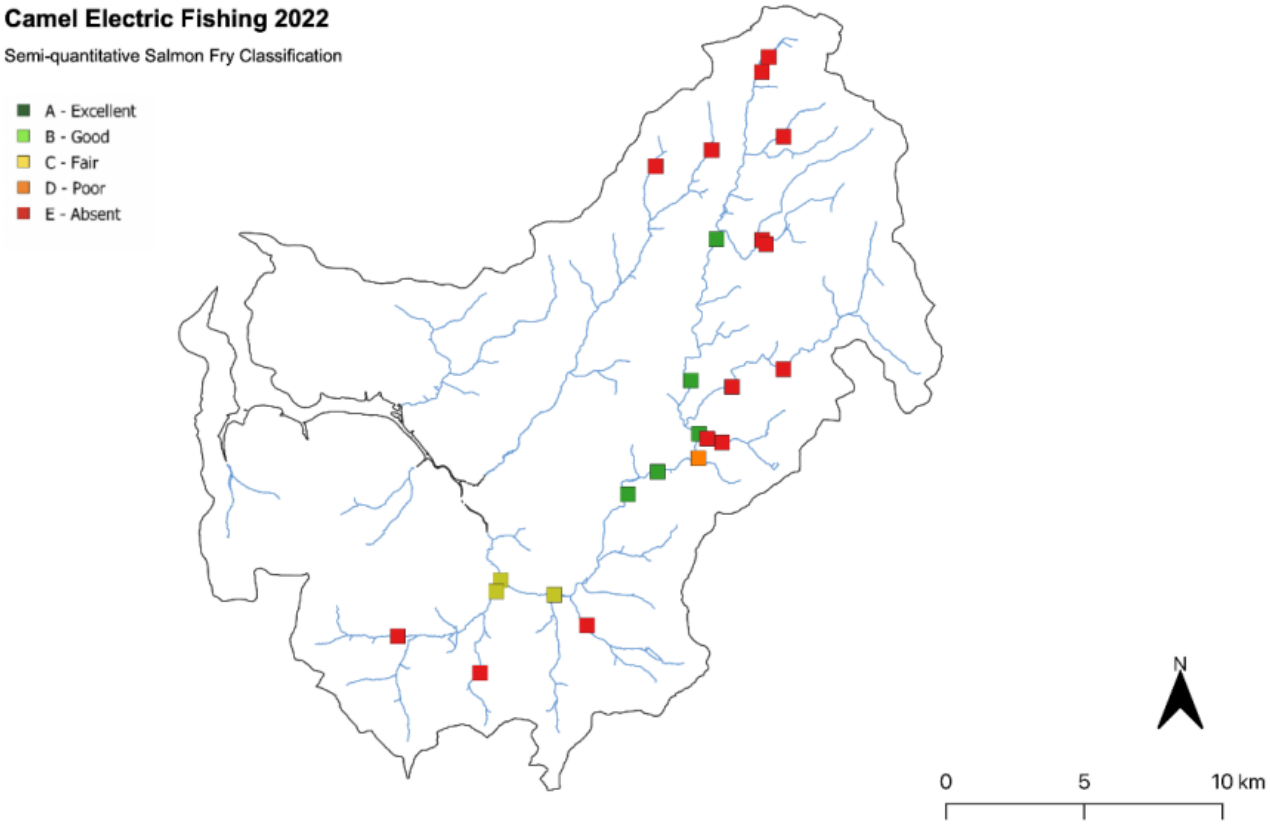
Appendix 1: Map of SSSI units and associated WFD waterbody catchment (APEM, 2023)



Appendix 2: Environment Agency sampling locations informing APEM water quality assessment (APEM, 2023)



Appendix 3: Map showing classification and location of the 2022 electric fishing results for salmon fry (WRT, 2022).



Appendix 4: Results from 2023 otter survey detailing absence or presence at each survey location.

Survey	Presence/Absence	Date	Notes	Unit
1	P	01/02/2023	Footprints	50
2	P	01/02/2023	1x spraint	50
3	P	01/02/2023	5x spraint	50
4	P	01/02/2023	2x spraint	50
5	P	01/02/2023	Footprints	50
6	P	08/02/2023	2x spraint, star jelly	51
7	P	08/02/2023	3x spraint	51
8	P	01/02/2023	5+ x spraint	51
9	P	25/01/2023	2x spraint	51
10	A	01/02/2023	No river access, anecdotal evidence from landowners of otter presence	51
11	P	25/01/2023	Footprints	52
12	A	25/01/2023	Watercourse not accessed, very steep sides	52
13	P	01/02/2023	Footprints	53
14	P	01/02/2023	Footprints	53
15	P	01/02/2023	2x spraint	53

Survey	Presence/Absence	Date	Notes	Unit
16	P	01/02/2023	1x spraint	53
17	P	01/02/2023	Star jelly and potential footprints	56
18	P	08/02/2023	2x spraint	56
19	A	01/02/2023	Location of recent gravel augmentation, anthropogenic disturbance evident	78
20	P	01/02/2023	4x spraint and star jelly	78
21	P	01/02/2023	2x spraint	78
23	P	08/02/2023	4x spraint	79
24	P	08/02/2023	4x spraint	79
25	P	08/02/2023	4x spraint and footprints	79
26	P	08/02/2023	1x spraint	79
12a	P	25/01/2023	Footprints	52

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