



**Cyfoeth  
Naturiol  
Cymru**  
**Natural  
Resources**  
Wales

# **NRW Evidence Report**

## **Otter Survey Wales 2015-2018**

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Report No: 519

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Otter mother and cubs in the Ebbw river © Dr Nelson Chen

## Rhagair

Yn yr hinsawdd economaidd ddiweddar yn y DU, mae fel pe bai wedi bod yn fwyfwy anodd dod o hyd i gyllid ar gyfer arolygon dosbarthiad rhywogaethau unigol i lywio asesiadau statws, p'un a yw'r rhywogaeth honno'n darparu baromedr pwysig o gyflwr yr amgylchedd ai peidio. Mae'r dyfrgi yn un rhywogaeth o'r fath, sy'n arwydd o iechyd yr amgylchedd dŵr, yn ogystal ag ansawdd y dirwedd afonol a'n graddau ein hunain o oddefgarwch i'r prif ysglyfaethwyr.

Felly, rwy'n ddiolchgar iawn i Brosiect Dyfrgwn Prifysgol Caerdydd ac i Cyfoeth Naturiol Cymru am gymryd y cam cyntaf i gydweithio i sicrhau'r cyllid ar gyfer y chweched arolwg o ddsbarthiad dyfrgwn yng Nghymru, ac am gydlynu'r arolygon, a gynhelir gan wirfoddolwyr yn bennaf, ledled y wlad. Mae hyn wedi galluogi Cymru i gadw golwg ar ddyfrgwn, gan ailadrodd y gweithgaredd yn fras bob saith mlynedd - nid oes yr un o wledydd cyfansoddol eraill y DU wedi gallu cyflawni'r gamp hon. Ni fyddai hyn wedi digwydd heb ymrwymiad a phenderfyniad awduron y ddogfen hon, ac rwy'n ddiolchgar iawn iddynt.

Fodd bynnag, nid tyst i'r hyn y gellir ei gyflawni drwy benderfynu a chydgyssylltu yn unig mo'r adroddiad hwn. Mae hefyd yn rhybudd. Am y tro cyntaf ers i'r gyfres o arolygon cenedlaethol o ddsbarthiad dyfrgwn ddechrau yng nghanol y 1970au, mae canlyniadau'r arolwg hwn yn datgelu gostyngiad sylweddol yng nghanran y safleoedd cadarnhaol. Mae'r duedd gadarnhaol yng nghyfran y safleoedd arolygu yng Nghymru a oedd ag arwyddion o ddyfrgwn wedi'i gwrthdroi'n annisgwyl, ac ar gyfer rhai o'r ardaloedd hydrometrig y rhennir y wlad ynddynt, mae'r gostyngiad yng nghanran y safleoedd cadarnhaol yn sylweddol.

Mae natur arolygon maes sy'n seiliedig ar arwyddion ar y raddfa hon bob amser yn cyflwyno posibilrwydd o wallau ac amrywioldeb yn y canlyniadau, oherwydd, er enghraifft, profiad yr arolygwyr, amodau tywydd (ac ar gyfer dyfrgwn gall amodau'r tywydd cyn yr arolygon arwain at lifeiriant gan gael gwared ar arwyddion maes) a gwahaniaethau tymhorol rhwng arolygon. Mae awduron yr adroddiad wedi ystyried yr holl ffactorau tebygol a allai fod wedi arwain at ganlyniad camarweiniol ac anghynrychioliadol, a hefyd wedi defnyddio adnoddau un o arolygwyr dyfrgwn mwyaf profiadol y wlad i ategu'r canfyddiadau ar ddau o'r dalgylchoedd.

Y casgliad yw nad yw'r defnydd o arolygwyr maes gwirfoddol hyfforddedig a ffactorau posibl eraill wedi dylanwadu'n ormodol ar gywirdeb canlyniadau'r arolwg, a bod y gostyngiad yng nghyfran y safleoedd cadarnhaol yn chweched arolwg cenedlaethol dyfrgwn Cymru yn wirioneddol, gyda'r casgliad bod gostyngiad mewn arwyddion yn y maes o'r raddfa hon yn golygu gostyngiad ym maint y boblogaeth. Nid yw'r rhesymau dros y dirywiad hwn ac arwyddocâd y gostyngiad hwn yn hysbys ar hyn o bryd, ond oni ellir priodoli hyn i amrywiadau naturiol ym mhoblogaethau'r prif ysglyfaethwyr (sy'n ymddangos yn annhebygol ond nid yn amhosibl), yna byddai'n ymddangos mai rhyw fath o straen amgylcheddol neu anthropogenig yw'r achos (ac mae'n debygol y byddai'r posibilrwydd cyntaf wedi'i achosi gan yr ail un).

Y neges glir sy'n deillio o'r adroddiad hwn yw na allwn fod yn hunanfodlon mwyach ynghylch adferiad parhaus y dyfrgi yn y DU, y cyfeirir ato'n aml fel un o'n

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Ilwyddiannau mawr ym maes cadwraeth. Mae'r adroddiad hwn yn tanlinellu'r angen nid yn unig i ymchwilio i'r rhesymau dros y dirywiad diweddar yng Nghymru, ond mae hefyd yn arwydd o'r angen am asesiadau cyfredol o statws dyfrgwn yn Lloegr, yr Alban a Gogledd Iwerddon, er mwyn canfod a yw'r tueddiadau mewn rhannau eraill o'r DU yn dilyn gwrthdroad tebyg, ai peidio. Dylid cynnal asesiad pellach o'r sefyllfa yng Nghymru mor fuan â phosib. Efallai mai system drwyadl o safleoedd gwyliaidwriaeth yw ein hopsiwn hirdymor gorau ar gyfer monitro newid dros amser a chanfod tueddiadau negyddol yn gyflym.

Y dyfrgi yw ein prif ysglyfaethwr ar systemau dŵr croyw ac mae hefyd yn rhywogaeth breswyl yn llawer o gynefinoedd arfordirol y glannau. Bu bron i ni golli'r mamal eiconig hwn dros lawer o'r DU - a hynny nid yn bell iawn yn ôl yn y gorffennol. Os oes perygl bod pedwar degawd o adferiad bellach yn cael eu tansilio neu eu gwrthdroi, mae angen inni wybod a yw hynny'n wir, ac os felly beth yw'r achosion fel y gellir mynd i'r afael â hwy'n effeithiol. Gallai'r dirywiad hwn, os yw'n digwydd yn eang ac yn barhaus, fod yn arwydd o fygythiad llawer mwy niweidiol i iechyd ein hecosystemau afonol.

Graham Scholey,

Asiantaeth yr Amgylchedd,

Cadeirydd – Grŵp Llywio Cynllun Gweithredu Bioamrywiaeth Dyfrgwn y DU

## Foreword

In the recent economic climate in the UK, it seems to have been more and more difficult to find funding for single-species distribution surveys to inform status assessments, irrespective of whether that species provides an important barometer of the state of the environment. The otter is one such species, indicative of the health of the water environment, as well as the quality of the riparian landscape and of our own degree of tolerance to top predators.

I am therefore very grateful to the Cardiff University Otter Project and to Natural Resources Wales in taking the initiative to collaborate in securing the funding for the sixth survey of the distribution of otters in Wales, and in co-ordinating the mainly volunteer-based surveys across the country. This has allowed Wales to maintain a degree of otter surveillance, on a roughly seven-year repeat basis, which none of the other UK constituent countries have been able to achieve. This wouldn't have happened without the commitment and resolve of the authors of this document, and I am very grateful to them.

This report however is not just testimony to what can be achieved through determination and co-ordination. It is also a wake-up call. For the first time since the series of national otter distribution surveys began in the mid-1970s, the results of this survey reveal a substantive decline in the percentage of positive sites. The positive trend in the proportion of survey sites in Wales which had signs of otters has been unexpectedly reversed, and for some of the hydrometric areas into which the country is divided the reduction in percentage of positive sites is significant.

The nature of sign-based field surveys of this scale will always introduce some degree of error and variability in the results, influenced for instance by the experience of the surveyors, weather conditions (and for otters antecedent weather conditions leading to spates can remove field signs) and seasonality differences between surveys. The report's authors have considered all the likely factors which may have led to a misleading and unrepresentative survey result, and also drew on the resources of one of the country's most experienced otter surveyors to corroborate the findings on two of the catchments.

The conclusion is that the use of trained volunteer field surveyors and other possible factors have not unduly influenced the veracity of the survey results, and that the decline in the proportion of positive sites in the sixth national otter survey of Wales is real, with the inference that a decline in field signs of this scale translates as a decline in population size. The reasons for and the significance of this decline are not currently known, but unless this can be laid at the door of natural fluctuations in top predator populations (which seems unlikely but not impossible), then it would seem evident that some form of environmental or anthropogenic stress is the cause (and likely the former caused by the latter).

The clear message coming out of this report is that we can no longer be complacent about the ongoing recovery of the otter in the UK, oft-cited as one of our conservation success stories. This report underlines the need not only to investigate the reasons for the recent decline in Wales, but also signals the need for up-to-date

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assessments of the status of otters in England, Scotland and Northern Ireland, in order to ascertain whether the trends in other parts of the UK are following a similarly worrying reversal (or indeed, are not). A further assessment of the situation in Wales should also be undertaken sooner rather than later. A comprehensive system of surveillance sites may be our best long-term option of monitoring change over time and detecting negative trends quickly.

The otter is our top predator on freshwater systems as well as a resident of many inshore coastal habitats. We almost lost this iconic mammal over much of the UK in the not too distant past. If there is a danger that four decades of recovery are now being undermined or reversed, we need to know whether that is true, and if so what the causes are so they can be effectively addressed. This decline, if widespread and sustained, could signal a much more insidious threat to the health of our river ecosystems.

Graham Scholey,

Environment Agency,

Chair – UK Otter Biodiversity Action Plan Steering Group

## Crynodeb Gweithredol

Mae'r dyfrgi Ewropeaidd (*Lutra lutra*) yn cael ei gydnabod yn eang fel symbol ar gyfer cadwraeth natur yn y DU oherwydd ei fod yn ysglyfaethwr cryf ac yn ddangosydd biolegol pwysig o iechyd ein hafonydd a'n gwlyptiroedd. Felly mae monitro statws y dyfrgi yn rhoi mesur gwerthfawr inni o gyflwr ecosystemau ein dyfroedd a'n gwlyptiroedd. Yng Nghymru fel mewn llawer o'r DU, mae'n anifail nosol i raddau helaeth ac anaml y gwelir ef yn y gwyllt. Fodd bynnag, mae'n bosibl canfod ei bresenoldeb trwy chwilio am ei faw nodedig a'i olion traed. Dirywiodd niferoedd dyfrgwn yn ddirifol trwy'r rhan fwyaf o'i gynefin yn Ewrop, ac erbyn canol y 1970au roedd poblogaeth dyfrgwn y DU wedi lleihau i'r fath raddau fel mai dim ond yn yr Alban, rhannau o Gymru a de-orllewin Lloegr y goroesai. Mewn mannau eraill, goroesodd ychydig o boblogaethau gweddilliol yng ngogledd a dwyrain Lloegr.

Cynhaliwyd yr arolwg cyntaf o ddyfrgwn yng Nghymru ym 1977-78, gan gwmpasu 1018 o safleoedd ar draws pob dalgylch afon. Yng Nghymru, cynhaliwyd arolygon ailadroddus o'r safleoedd llinell sylfaen ym 1984-85, 1991, 2002 a 2009-10 gan ddefnyddio'r un dull ac ymweld â'r un safleoedd. Cafwyd hyd i ganran gynyddol o safleoedd gydag arwyddion o ddyfrgwn ar draws yr arolygon, gan arwain at y casgliad bod niferoedd dyfrgwn yng Nghymru wedi adfer yn dda trwy ehangu naturiol. Rhagwelwyd adferiad llawn yn y degawd canlynol.

Yn 2015 a 2016 cynhaliodd Prosiect Dyfrgwn Prifysgol Caerdydd arolwg o safleoedd arolygu cenedlaethol ar draws chwe dalgylch afon a nodi dirywiad mewn arwyddion. Cydweithiodd Cyfoeth Naturiol Cymru â Phrosiect Dyfrgwn Prifysgol Caerdydd i drefnu arolygon o'r safleoedd oedd yn weddill ledled Cymru i gwblhau chweched Arolwg Dyfrgwn yng Nghymru. Roedd y gwaith yn dibynnu'n fawr ar syrfewyr gwirfoddol, ond rhoddwyd hyfforddiant i bob un os nad oedd ganddynt brofiad blaenorol.

Rhannwyd Arolwg Dyfrgwn Cymru ar sail 15 ardal Hydrometreg yn unol ag Arolygon Dyfrgwn blaenorol Cymru (a sefydlwyd fel data sylfaenol 1977-78) ac fe'i cyflwynir yma i helpu i gymharu data. Cofnodwyd arwyddion o ddyfrgwn mewn 756 o safleoedd allan o gyfanswm cenedlaethol o 1073 gan roi canran y safleoedd positif fel **70.46%**. **Mae hyn yn cynrychioli gostyngiad o 22% yn nifer y safleoedd ag arwyddion o ddyfrgwn ers yr arolwg diwethaf. Dyma'r dirywiad cyntaf a gofnodwyd yng Nghymru ers i arolygon cenedlaethol ddechrau yn y 1970au.** Gwnaed asesiad trylwyr o ddilysrwydd y canlyniadau hyn a deugn i'r casgliad na ellir priodoli'r dirywiad mewn arwyddion o ddyfrgwn i brofiad syrfewyr na llif afonydd yn golchi arwyddion o ddyfrgwn ymaith. Yn ogystal, gwiriwyd gostyngiadau ar ddau ddalgylch gan syrfewr profiadol iawn trwy ailadrolygu.

Roedd gan bob ardal hydrometrig ganran is o safleoedd positif ar gyfer dyfrgwn yn yr arolwg hwn (2015-18) na'r arolwg diwethaf (2009-10). **Yr ardaloedd sy'n achosi pryder yw'r ardaloedd hydrometrig hynny lle gostyngodd arwyddion o ddyfrgwn fwy nag 20% a lle roedd y dirywiad yn ystadegol arwyddocaol; Conwy, Llŵchwr, Tywi, Wysg, Teifi, Gwy, Morgannwg Ganol a Glaslyn.** Fodd bynnag, mae hyn yn ddigon eang fel na ddylid anwybyddu ardaloedd eraill.

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Nid oes perthynas uniongyrchol rhwng nifer yr arwyddion o ddyfrgwn yn y maes a nifer y dyfrgwn, fodd bynnag, deir i'r casgliad bod yn rhaid bod y gostyngiad a geir yn yr arolwg hwn yn cynrychioli gostyngiad yn nifer y dyfrgwn yng Nghymru. Mae'n anodd priodoli achos dros y dirywiad hwn. Ni chredir bellach fod llygryddion parhaus a marwolaethau o achos traffig ar y ffyrdd yn cyfyngu ar boblogaethau, er bod diffyg gwybodaeth o hyd am rai o'r sylweddau blaenoriaeth mwy newydd. Mae'n ymddangos bod diet dyfrgwn wedi newid yn seiliedig ar y dystiolaeth sydd ar gael a gallai dirywiad mewn rhai rhywogaethau ysglyfaethus, sy'n adlewyrchu tueddiadau ehangach yn statws rhai pysgod mudol allweddol, fod yn cyfyngu ar rai poblogaethau lleol o ddyfrgwn. Mae angen monitro statws poblogaeth y dyfrgwn ymhellach yng Nghymru i weld a fydd y gwrthdroad presennol hwn yn nhuedd y boblogaeth yn parhau, ac mae angen ymchwilio i achosion y dirywiad a awgrymir yma.

## Executive Summary

The European otter (*Lutra lutra*) is widely recognised as an emblem for nature conservation in the UK because it is a top predator and an important biological indicator of the health of our rivers and wetlands. Monitoring the status of the otter therefore gives us a valuable measure of the state of our water and wetland ecosystems. In Wales as in much of the UK, it is a largely nocturnal animal and is rarely observed in the wild. It is however possible to detect its presence by searching for its distinctive droppings (spraints) and footprints. The otter suffered serious declines throughout most of its European range, and by the mid-1970s the UK otter population had been reduced to such an extent that it only survived in Scotland, parts of Wales and south-west England. Elsewhere, a few remnant populations survived in northern and eastern England.

The first otter survey of Wales was carried out in 1977-78 covering 1018 sites across all the river catchments. In Wales repeat surveys of the baseline sites have been carried out in 1984- 85, 1991, 2002 and 2009-10 using the same method and visiting the same sites. An increasing percentage of sites were found with otter signs across the surveys, leading to the conclusion that otters in Wales had made a good recovery through natural expansion. Full recovery was predicted in the following decade.

In 2015 and 2016 Cardiff University Otter Project (CUOP) surveyed national survey sites across six river catchments and noted a decline in signs. Natural Resources Wales collaborated with CUOP to organise surveys of the remaining sites across Wales to complete a sixth Otter Survey of Wales. The work relied heavily on volunteer surveyors, but all were given training if they had no prior experience.

The Otter Survey of Wales was divided on the basis of 15 Hydrometric areas in accordance to previous Otter Surveys of Wales (established as baseline data 1977-78) and is presented here to aid comparison of data. Signs of otters were recorded at 756 sites out of a national total of 1073 giving the percentage of positive sites as **70.46%**. **This represents a 22% decline in the number of sites with otter signs since the last survey. This is the first decline recorded in Wales since national surveys began in the 1970s.** Thorough assessment of the validity of these results was made and we conclude that the decline in otter signs cannot be attributed to surveyor experience or river spate washing away otter signs. Additionally, declines on two catchments were verified through resurvey by a highly experienced surveyor.

All hydrometric areas had a lower percentage of sites positive for otters in this survey (2015-18) than the last survey (2009-10). **Areas of concern are those hydrometric areas where otter signs declined more than 20% and the decline was statistically significant; Conwy, Loughor, Tywi, Usk, Teifi, Wye, Mid-Glamorgan and Glaslyn.** However, this is sufficiently widespread that other areas should not be ignored.

There isn't a direct relationship between the number of otter field signs and the number of otters, however, it is concluded that the decrease found in this survey must represent a decrease in the number of otters in Wales. It is difficult to ascribe a

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cause for this decline. Persistent pollutants and road traffic casualties are no longer thought to restrict populations, although information on some of the newer priority substances is still lacking. Otter diet appears to have changed based on the evidence available and a decline in some prey species, largely reflecting more widespread trends in the status of some key migratory fish, may be restricting some local otter populations. Further monitoring of the status of the otter population in Wales is necessary to see if this current reversal in population trend continues, and research is needed to investigate the causes for the decline suggested here.

## Introduction

### Background

National surveys of otters have been conducted by each of the nations of the UK since the 1970s when a substantial decline in otter populations had been noted, with complete absence from some regions. These systematic surveys were conducted by experienced professionals using the same “standard otter survey methodology”. Generally, the interval between the surveys has been 7 years up to 2010 (Table 1), allowing the recovery of the otter across the UK to be tracked. By the fifth otter survey of Wales in 2009-10, almost 90% of the 1108 survey sites in Wales were found to have signs of otter presence (Strachan, 2015). The recovery was through natural expansion from remnant populations as a direct result of the banning of certain pollutants, legal protection of the otter since 1978, and improvements in general water quality since the 1970s (summarised in Chanin 2003). The last surveys in England and Scotland were conducted in 2010 and 2011-12 respectively. Throughout the UK, the otter recovery has been hailed as a conservation success story. Full recovery across Wales was predicted by 2020 (Strachan, 2015).

In Wales in 2015 and 2016 Cardiff University Otter Project (CUOP) resurveyed national survey sites across six river catchments in south Wales, in order to investigate otter diet. CUOP used similar methodology to previous national surveys, with the addition of recruiting and training volunteer surveyors. Natural Resources Wales and Cardiff University collaborated in 2017 and 2018 to organise surveys of the remaining survey sites across all Wales hydrometric areas. The sixth otter survey of Wales was thus conducted by many individuals with varying experience, from recently trained volunteers to highly experienced professionals.

Table 1 Results of past otter surveys of Wales

	First	Second	Third	Fourth	Fifth
Years	1977-78	1984	1991	2002	2009-10
Sites with signs of otters	20%	38%	53%	72%	90%

## Aims and Objectives

The overall aim of the sixth otter survey of Wales was to replicate as closely as possible the previous surveys, to allow meaningful comparisons to be made with the data from these surveys and to add to our understanding of the distribution of otters within Wales. This sixth survey was conducted with less budget so some changes in methodology were necessary.

The 2015-18 survey had the following objectives:

- To assess whether the recovery of otters reported in the previous national otter surveys for Wales was maintained.
- To assess the viability and accuracy of conducting national otter surveys with volunteers.

## Methods

The sixth otter survey of Wales was conducted by volunteers with a varied level of otter survey experience. This ranged from individuals who had attended a one-day training course through to highly experienced expert otter surveyors. Individuals classed as experienced (see validation section) surveyed 68% of sites. Training courses held in south and mid-Wales were run by Cardiff University Otter Project and funded by the Society of Biology; training courses in north Wales were run by North Wales Mammal Group, Snowdonia National Park Authority and Wildlife Trust staff. Surveyors included NRW staff, Cardiff University staff and students, Wildlife Trust staff, consultant ecologists, local mammal groups and local naturalists and were coordinated jointly by Drs Eleanor Kean and Elizabeth Chadwick, Cardiff University and Becky Clews-Roberts, Natural Resources Wales. Each hydrometric area (Figure 1) had an assigned area coordinator to oversee the localised recruitment of volunteers and distribution of survey instructions and recording sheets.

It was not possible to provide travel expenses incurred by all volunteers, although limited funding was available for Cardiff University volunteers in 2015 and 2016. NRW provided some funds to support coordination and report writing. The total cost of the entire programme was therefore minimal.

## Site selection

The survey sites were those surveyed in previous national otter surveys, with the exception of sites that had changes in accessibility, either physical or landowner permission resulting in a small number of sites being omitted or moved (detailed in each hydrometric area section). Grid references of previous survey sites and site maps were available from the 2009-10 survey. The number of survey sites within each hydrometric area varied depending on size of the hydrometric area. Surveys were conducted between May 2015 and April 2018 (Table 2).

## Fieldwork methodology

To maximise comparability with previous otter surveys of Wales, the survey methodology followed that used in all previous surveys (Crawford, Evans, Jones & McNulty 1979, Andrews & Crawford 1986, Andrews, Howell & Johnson 1993, Jones & Jones, 2004, Strachan, 2015). All surveyors were provided with survey instructions detailing the fieldwork methodology. The access point of each survey site was searched for signs of otters (spraint, footprints, slides, holts) if none were found there, the surveyors were requested to survey a maximum of 300m upstream and 300m downstream. In practice this was not always possible due to access e.g. bank side vegetation or the gradient of the riverbank. Surveying ceased when the first otter spraint (or occasionally) footprint was located and so confirming otter presence at a site. Spraints were identified by smell and appearance. Spraints found in 6 hydrometric areas in south Wales were collected and their identification verified at Cardiff University. Only one surveyor who surveyed ten sites, had collected samples

## OTTER SURVEY OF WALES 2015-2018

that were not otter spraint. All of the sites surveyed by that individual were resurveyed by a more experienced surveyor.

Table 2 Number of sites surveyed in each hydrometric area and timescales over which they were surveyed.

Hydrometric Area	Number of Sites	Survey dates
Anglesey	34	July to September 2017
Cleddau	67	August 2015 to September 2017
Clwyd	36	June 2017 to April 2018
Conwy	35	May 2017 to April 2018
Dee	59	June 2017 to April 2018
Dyfi	93	July 2017 to February 2018
Glaslyn	99	July to December 2017
Loughor	43	November 2017 to April 2018
Mid-Glam	57	September 2017 to February 2018
Severn	101	May 2015 to November 2017
Taff	39	June to October 2017
Teifi	74	July 2015 to September 2017
Tywi	90	May 2015 to October 2017
Usk	58	June 2015 to September 2017
Wye	128	May 2015 to November 2017
Ystwyth	60	July 2017 to April 2018

## Recording in the field

Surveyors recorded date, weather, distance surveyed, otter signs, description of spraint sites, mink (*Neovison vison*) signs and other species of interest on a pre-printed survey form which included site number, site name, grid reference and a map.

## Access arrangements

The sites used in the national otter surveys were originally selected for ease of access in order to avoid a need for access permission in most cases. Surveyors requested access permission on an *ad hoc* basis, usually by knocking on doors, as they felt necessary. In many cases surveys could be conducted using public access, for example, public roads or footpaths. When access was denied, the site was relocated to the next nearest access point on the watercourse or the site was omitted.

## Health and safety

All surveyors were advised to take great care at all times and to conduct surveys in pairs or use a "buddy system". Some local groups had their own insurance for surveys, otherwise there was no insurance cover from Natural Resources Wales and surveys were completed voluntarily and surveyors were alerted to the fact that they

## OTTER SURVEY OF WALES 2015-2018

were taking the risk upon themselves. Surveyors were advised to avoid contact with otter spraint, by either wearing gloves when handling otter spraint, or using a stick to move them. Surveyors were advised to wash their hands at the end of each survey.

### **Timing and weather conditions**

Surveyors were asked to avoid surveying when there had been heavy rain, as spraint and prints can be washed away. Surveyors were asked to survey each site in the same month it was surveyed in the previous survey. Where date was recorded accurately in both surveys (=732 sites), in the 2015-17 survey 73% of sites were surveyed within the same month or +/-3 months as the 2009-10 survey.



Figure 1 Hydrometric Areas of Wales

## Overall Results

In the sixth (2015-2018) national otter survey of Wales, otter field signs were observed at **70%** (756/1073) of survey sites (Table 3 and Figure 2). The percentage of survey sites where otter field signs were observed (positive sites) declined by 21.62% since the fifth national otter survey (Table 3 and Figure 3 and 4) in 2009-2010. A decline in percentage positive sites was recorded for every hydrometric area, although the declines were not statistically significant in seven of the 16 areas, in particular the Severn hydrometric area saw a decline of just 1%.

Table 3 Results of the Otter Survey of Wales 2015-2018 by hydrometric area and comparison with results recorded in the 2009-2010 survey.

For the purposes of consistency with previous national otter surveys, the hydrometric Area covering Conwy and Clwyd was split. Hydrometric areas ordered by size of decline from smallest.

Hydrometric area	5 <sup>th</sup> OSW 2009-2010		6 <sup>th</sup> OSW 2015-2018		Percentage decrease between 5 <sup>th</sup> and 6 <sup>th</sup> surveys	Statistical significance (df=1), $\chi^2$ value, NS= p * p<0.05 **p<0.01 *** p<0.001
	Number of sites surveyed	Percentage positive	Number of sites surveyed	Percentage positive		
<b>Severn</b>	101	94.1	101	93.07	1.09	0.00 NS
<b>Dee</b>	59	93.2	59	84.75	9.07	1.38 NS
<b>Dyfi</b>	97	78.4	93	70.97	9.48	0.70 NS
<b>Ystwyth</b>	65	89.2	60	78.33	12.19	2.01 NS
<b>Cleddau</b>	67	97	67	83.58	13.84	5.45 *
<b>Taff</b>	42	78.6	39	66.67	15.18	0.91 NS
<b>Clwyd</b>	36	94.4	36	77.78	17.61	2.90 NS
<b>Anglesey</b>	40	67.5	34	52.94	21.57	1.08 NS
<b>Tywi</b>	90	94.4	90	73.33	22.32	13.32 ***
<b>Wye</b>	129	96.1	128	72.66	24.39	25.17***
<b>Usk</b>	62	88.7	58	65.52	26.13	7.96**
<b>Mid-Glam</b>	61	70.5	57	50.88	27.83	9.78 *
<b>Glaslyn</b>	99	91.9	99	61.62	32.95	23.82 ***
<b>Loughor</b>	50	100	43	62.79	37.21	19.93 ***
<b>Conwy</b>	36	94.4	35	57.14	39.47	11.59***
<b>Teifi</b>	74	95.9	74	50	47.86	37.31 ***
<b>OVERALL</b>	1108	89.9	1073	70.46	21.62	127.66 ***

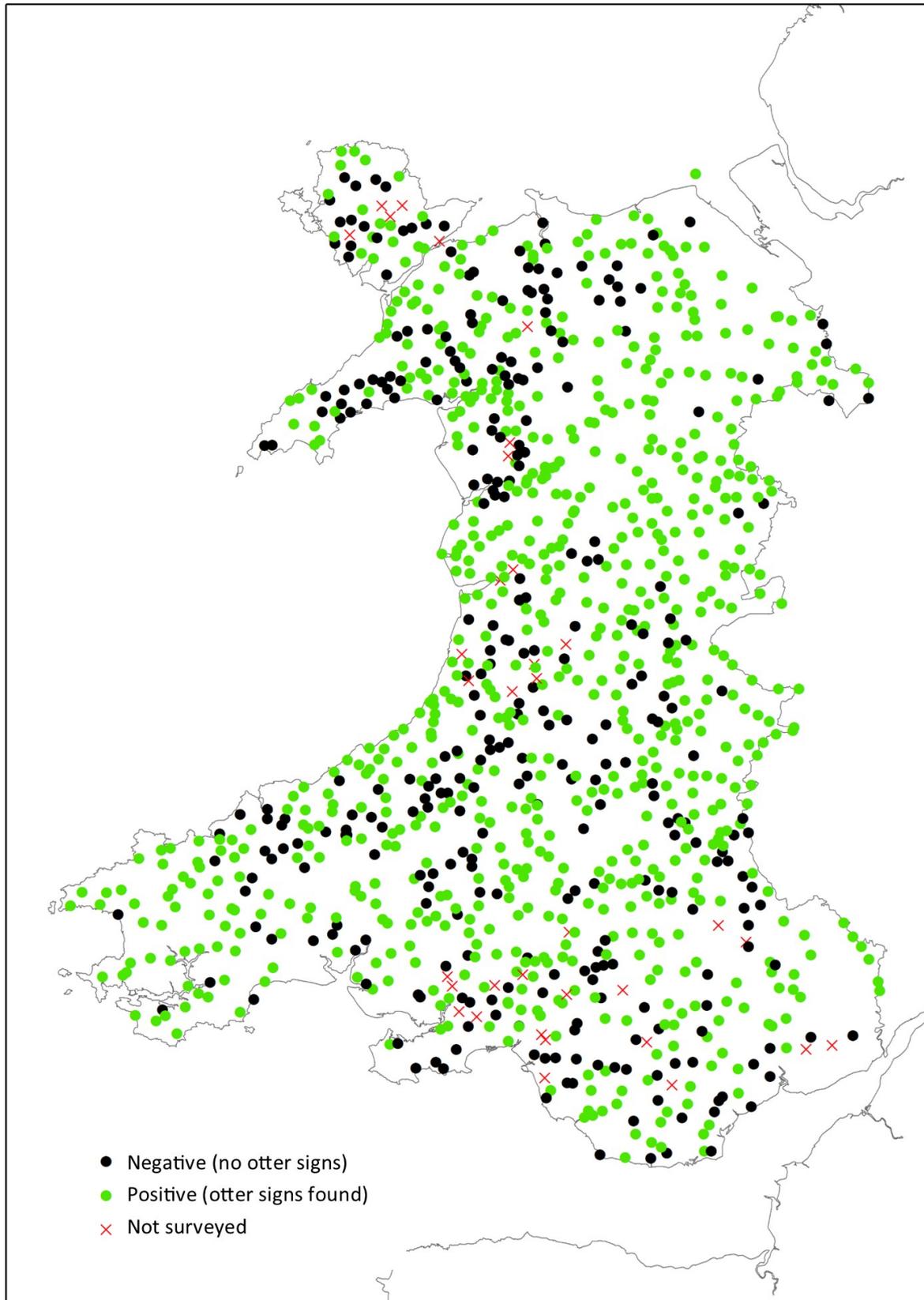


Figure 2 Sixth otter survey Wales 2015-2018 distribution of positive and negative sites

# OTTER SURVEY OF WALES 2015-2018

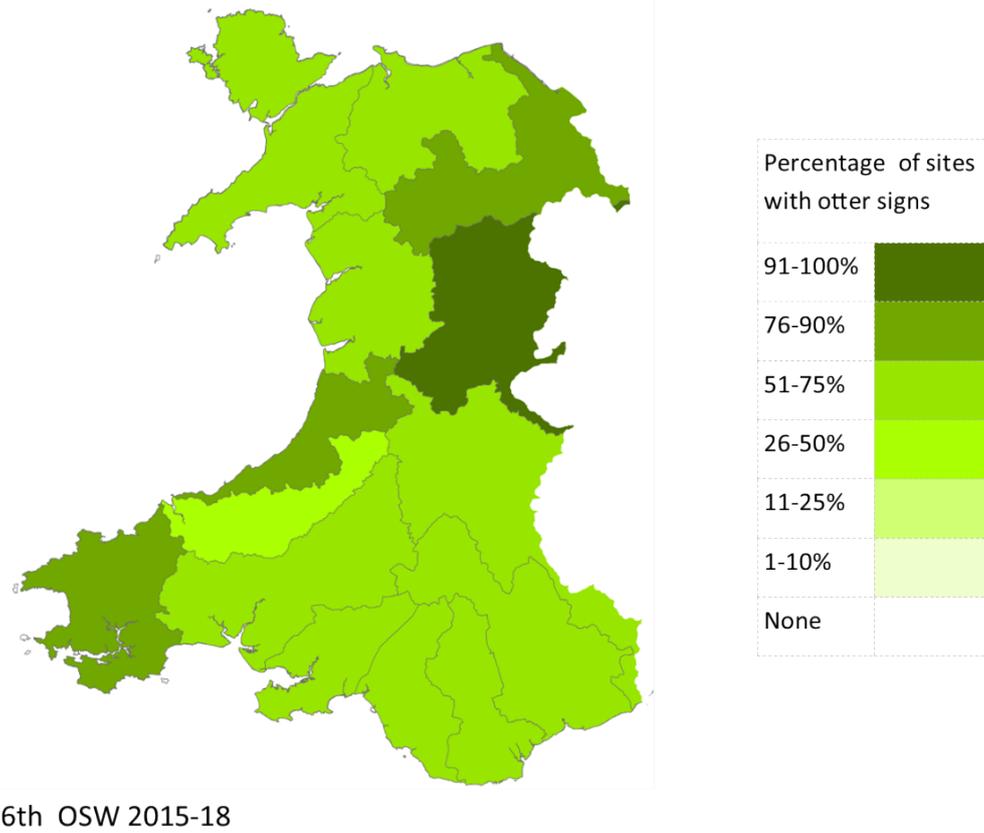
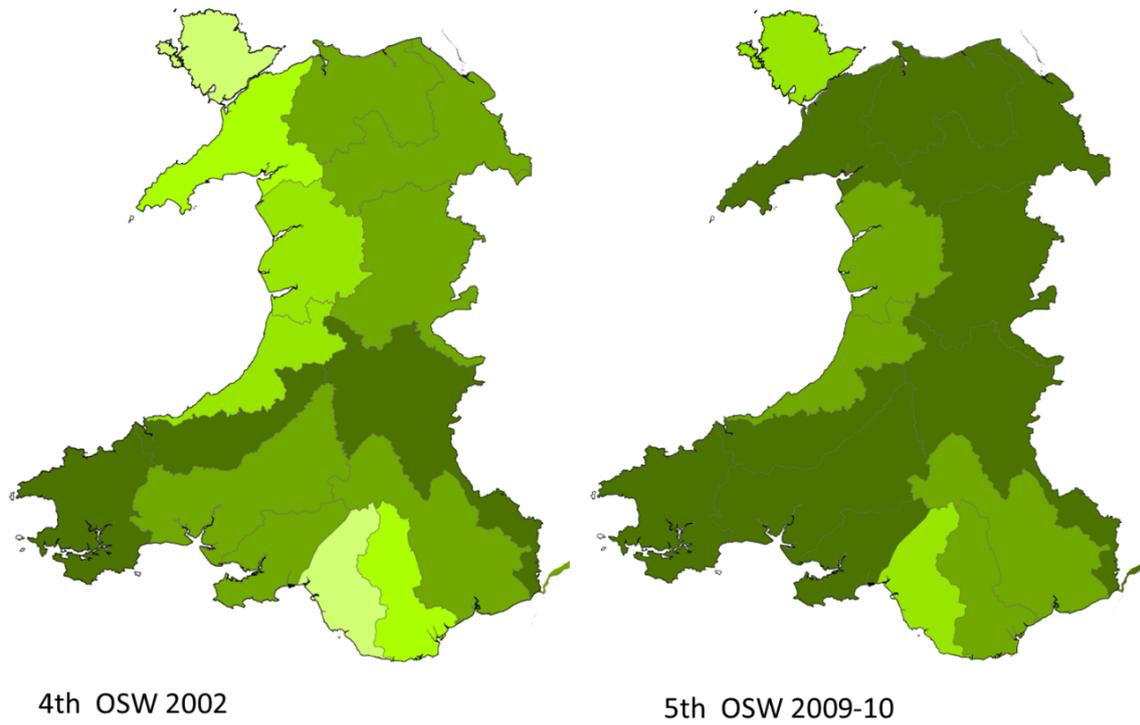


Figure 3 Comparison of last three otter surveys of Wales

# OTTER SURVEY OF WALES 2015-2018

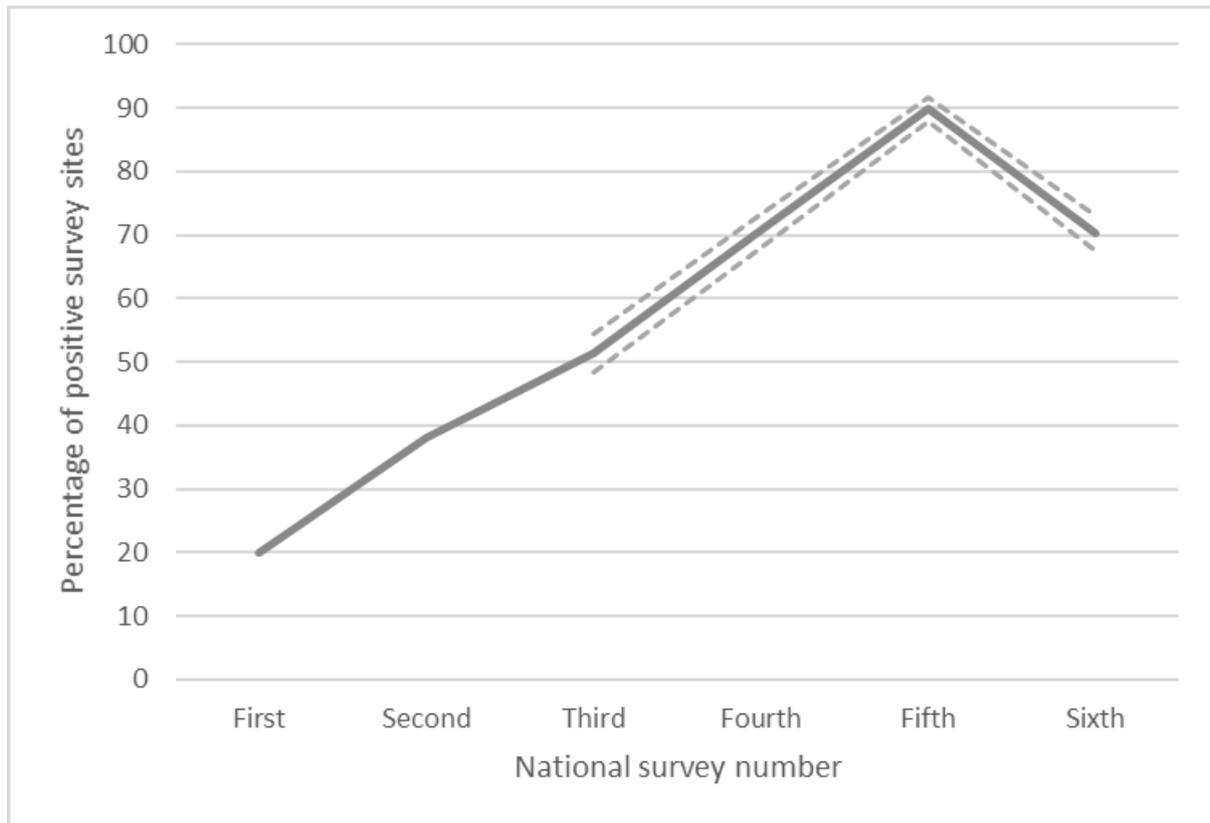


Figure 4 Overall percentage of sites occupied by otters between 1977 and 2018 as described by the six national surveys for Wales, with 95% confidence intervals where data were available.

## Results by hydrometric area

### Sources of hydrometric area information

Each hydrometric area section includes a description, and summaries of water quality and fishery data where available. The paragraphs below detail the sources of that information:

#### Description

Hydrometric area descriptions are largely based on the NRW 2016 Management Catchment Summaries. Natural Resources Wales and the Environment Agency are jointly responsible for managing the Dee, Severn and Wye hydrometric areas. Catchment summaries were not available for these hydrometric areas so the following were used for the Dee, Severn and Wye hydrometric area descriptions: Dee River Basin Management Plan Summary 2015, Severn River Basin Management Plans and previous descriptions in OSW 2009-10.

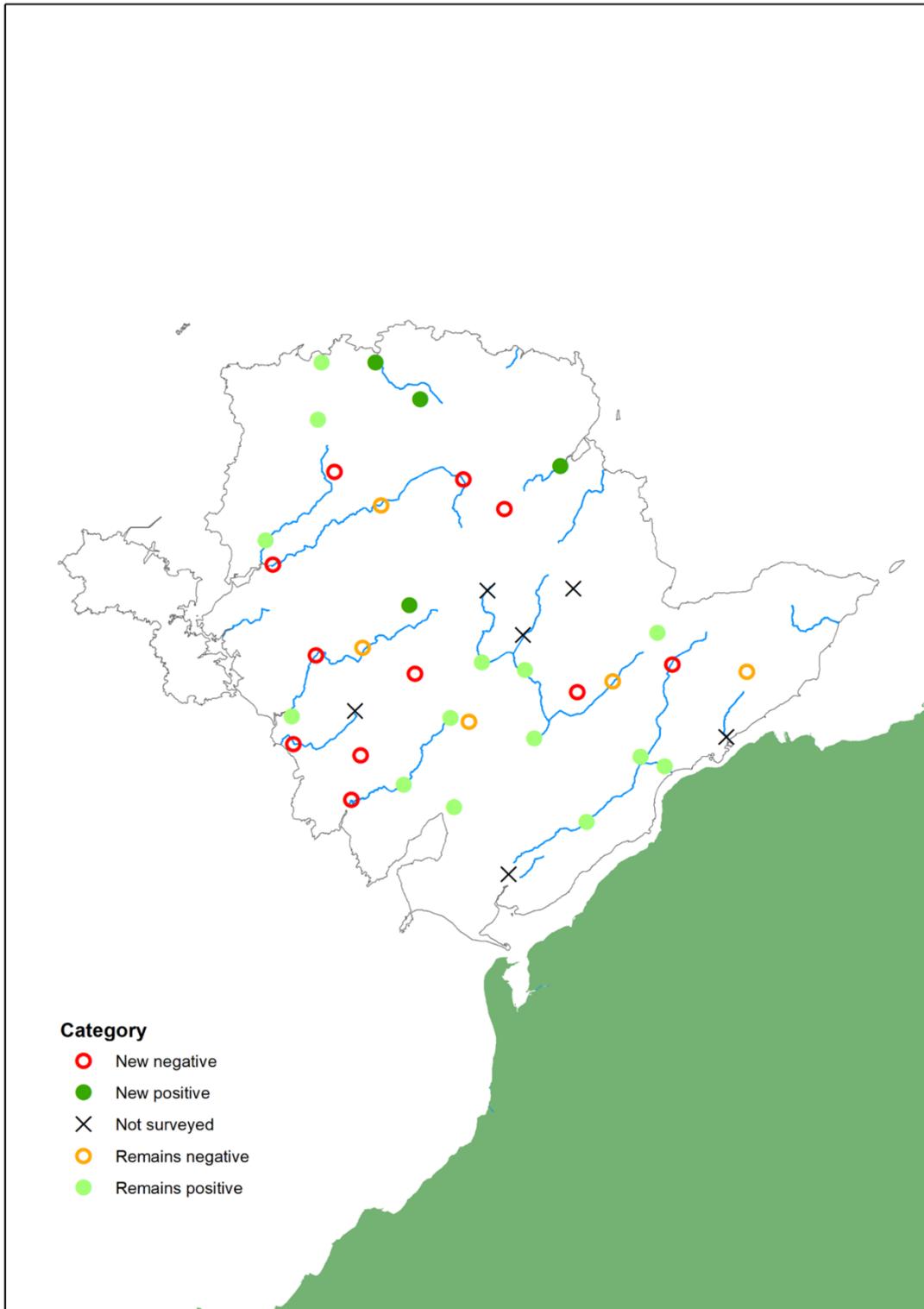
#### Water quality

The Water Framework Directive (WFD) is an EU directive which commits European Union member states to achieve good status of all water bodies. The most relevant management catchment summaries available were produced in 2016 and using the 2015 Water Framework Directive classification of waterbodies. Therefore, the WFD classification in the hydrometric area sections of this report also refer to 2015 classifications, unless otherwise stated. Whilst 2018 data would be preferable, analyses of raw WFD data were beyond the scope of this report. Summary reporting on Cycle 2 overall Interim Classification 2018 for surface waters indicates little change between 2015 and 2018. For the Severn and Wye hydrometric areas WFD data were obtained from the River Basin Planning Progress Report for Wales 2009-2015.

#### Fisheries

A brief note on the fisheries was made where summaries of data were available, largely from the NRW Know Your Rivers reports and the NRW Salmon and sea trout catch controls 2017 consultation Annex 3 Rod and net catches; and juvenile salmon and trout data, and an addendum to that. Focus is on rod and net catches between the previous otter survey and this otter survey, i.e. 2010 to 2018. The Salmon stock performance in Wales 2018 and the Sea trout stock performance in Wales 2018 were also consulted. Analyses of raw data of other fish species were beyond the scope of this report.

## Ynys Môn/ Anglesey



## General description

The landscape of Ynys Môn/Anglesey is dominated by agriculture. Tourism is of great economic importance to the island, and maintaining the quality of the general environment, bathing waters and associated water-based recreation is a high priority. The island has many sites designated for conservation and biodiversity purposes. The coastline of cliffs and sandy beaches has 13 EU designated bathing waters, as well as designated shellfish beds. There are several small industrial estates located near the main population centres such as Llangefni, and Holyhead with its ferry terminal. The west of the island is a nitrate vulnerable zone. A number of lakes on Anglesey have been modified for public water supply.

Within the Ynys Môn Management Catchment 6% of surface water bodies were at high overall WFD classification status, 37% at good, and 57% at moderate overall status. There were no water bodies at poor or bad overall status.

No fisheries summaries were available for Anglesey.

## Results

All sites were surveyed between July and September 2017 and otter signs were found at 53% (Table 4). There was a **22% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this decline was not statistically significant (Table 2 in overall results section).

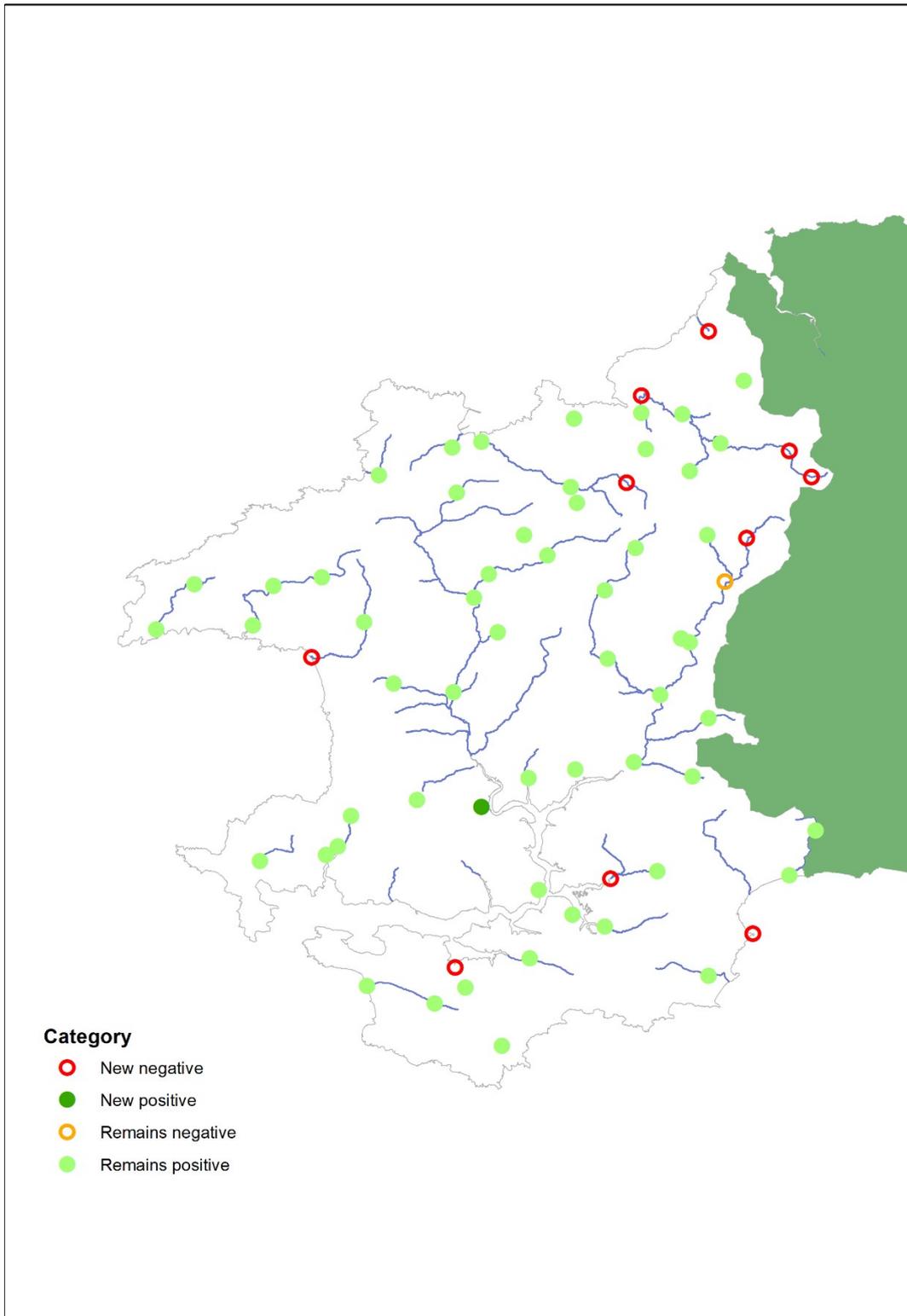
Table 4 Anglesey results

	1977-78	1984	1991	2002	2009-10	2017
Positive sites (positive/total)	7/39	0/40	0/40	7/40	27/40	18/34
% positive	18%	0%	0%	18%	67%	53%

## Discussion

Following a previously impressive recovery between 2002 to 2009-10, there has been a decline in the number of survey sites with otter field signs. The newly negative sites are widespread across the area with no apparent pattern by distance to the coast or overall water body status. Over a relatively small area for a wide ranging species such as the otter and with only 34 sites surveyed, it is not possible to say if this decline is of concern or normal fluctuation.

## Cleddau



## Description

The area is largely of a lowland nature although the two larger rivers, the Eastern and Western Cleddau, drain partially from the Preseli Hills. The land is sparsely populated, for the most part, with urban development usually within the floodplains of the larger rivers, which has created a number of flooding problems. Straddling the Western Cleddau, the market town of Haverfordwest is the largest urban area and serves as Pembrokeshire’s administrative and commercial hub. Other significant urban areas are the coastal towns of Tenby, Pembroke Dock, Pembroke, Fishguard and Milford Haven, with its energy industry and port.

The catchment is characterised by intensive agriculture, mainly dairy farming, although sheep rearing and early potato growing are locally important. Dairy farming in particular plays an important part in the local economy. Pembrokeshire produces 50% of Welsh potatoes and 25% of Welsh milk. Pembrokeshire is renowned as a holiday area, with the population increasing two-fold during the peak season. The river and estuary comprise a Special Area of Conservation (SAC) as does approximately 75% of Pembrokeshire’s 186-mile coastline.

Within this management catchment 42% of surface water bodies were at good overall WFD classification status, 51% at moderate, 5% at poor and 2% at bad overall status. There were no water bodies at high overall status.

The Eastern and Western Cleddaus support a locally important salmon and sea trout (sewin) fishery. Sea trout are the principal salmonid, with a reasonable number of salmon also present. Declared salmon rod catches were variable between 2009 and 2018, with the highest catch recorded in 2009 and 2010. Declared rod catches for sea trout are also variable over the period and have been in steady decline since 2012. Net catches were variable, highest in 2010 and 2011 for salmon and very low or nothing in 2016-2018. In 2018 the East and West Cleddau the status of both salmon and sea trout stock were “at risk”.

## Results

Sites were surveyed between August 2015 and August 2016 and 1 site in September 2017 (all in the months of August and September). Otter signs were found at 84% (Table 5). There was a **14% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

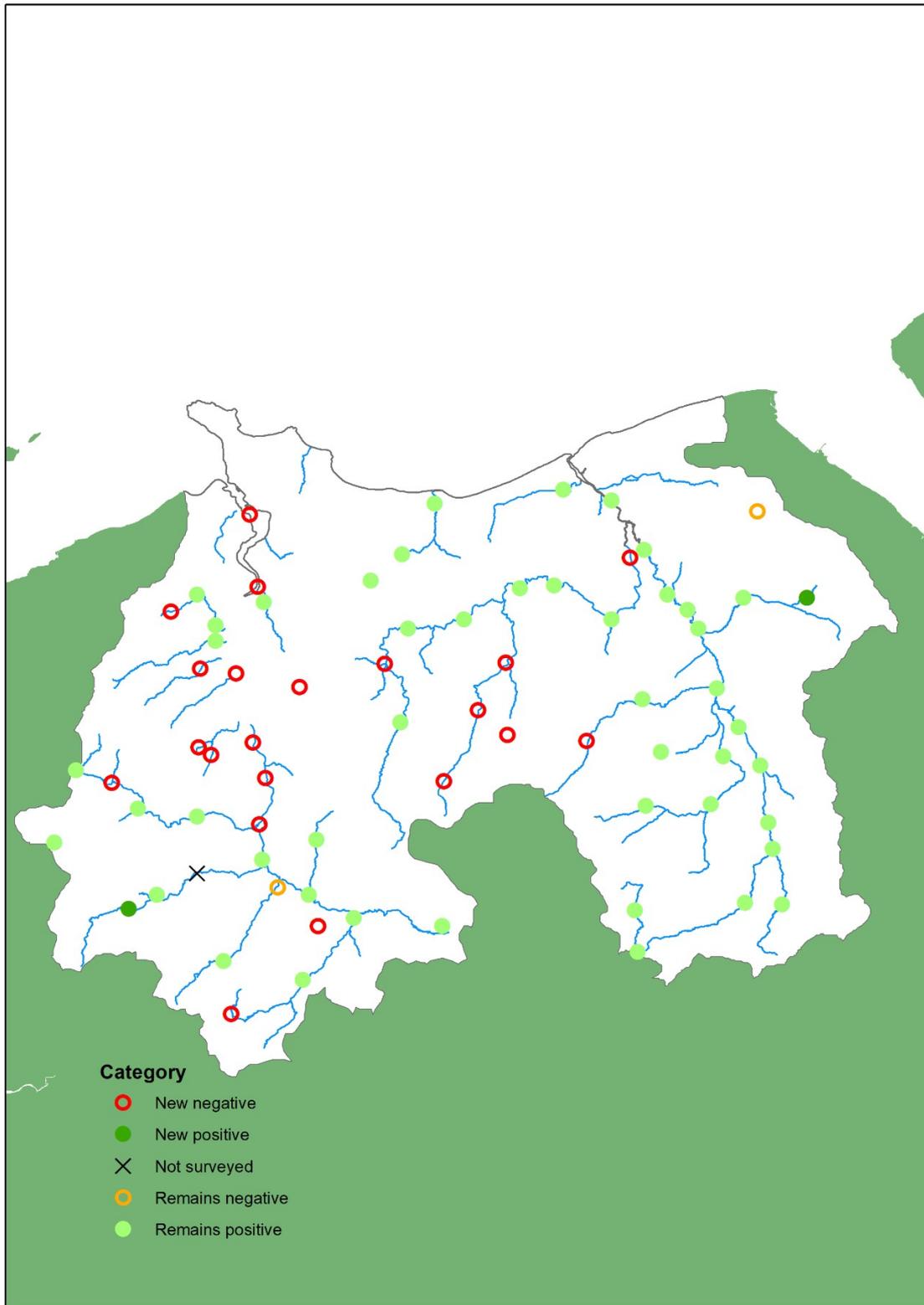
Table 5 Cleddau results

	1977-78	1984	1991	2002	2009-10	2015-17
Positive sites (positive/total)	23/58	36/67	52/67	64/66	65/67	56/67
% positive	40%	54%	78%	97%	97%	84%

## Discussion

The Cleddau hydrometric area has always had a good percentage of sites positive for otters compared to the other hydrometric regions in Wales. At 84% positive, it remains a favourable area for otters. Although the 14% decline in percentage positive signs since the last survey in 2009-10 was statistically significant, it is very similar to the 85.9% positive results of another survey of the Pembrokeshire Coast SAC by Geoff Liles in 2009 (reported as pers. com in Strachan, 2015). Six out of ten of the new negative sites are in the north east of the area close to the Teifi catchment which had the largest decline in otter signs since the 2009-10 survey.

## Clwyd and Conwy



## Description

The Conwy and Clwyd are adjacent but distinct river systems flowing north into the Irish Sea on the North Wales coast. Agriculture and forestry are the main land uses, with sheep farming in the uplands and mixed livestock rearing and dairy with some arable crops lower down the catchments. Recreation and tourism are important to the local economy.

The **Clwyd** has its headwaters in Clocaenog forest and the Elwy, a major tributary, rises slightly to the west in the Hiraethog moors. Part of the lower catchment is a nitrate vulnerable zone for both surface and groundwater. The lower part of the Clwyd was canalised in medieval times from Rhuddlan to the sea. Modified natural lakes provide public water supplies, and the main river Clwyd is supported by ground water augmentation when flows are naturally low. Populations are centred on Ruthin, Denbigh, St Asaph and Rhyl. The Clwydian range and Dee Valley Area of Outstanding Natural Beauty is a popular location for walkers. The coastal plain has EU designated bathing waters at Rhyl, Prestatyn and Kinmel Bay.

In the 2015 WFD classification, within the Clwyd management catchment 52% of surface waters are at good overall status, 42% at moderate and 6% at poor. There are no surface water bodies at high or bad overall status. The catchment is also important for salmon and sea trout fishing, however the salmon rod catch was exceptionally poor for 2013-2018, as was the sea trout catch in 2018. In 2018 the status of Clwyd salmon and sea trout stocks were “at risk”.

The source of the **Conwy** is in the uplands of the Migneint, an extensive area of blanket bog and part of the Migneint-Arenig-Ddualt SAC. Much of the catchment above Llanrwst and the western side of the lower Conwy Valley lies within Snowdonia National Park. The Conwy area contains drinking water supply reservoirs including Llyn Conwy and Llyn Cowlyd and a major hydropower generation at Dolgarrog. There is a legacy of mining activities particularly in the Gwydyr Forest with abandoned mine shafts, adits, soil heaps and site run off influencing discharges of metals to surface waters.

Within this management catchment 24% of surface water bodies were at good overall WFD classification status, 70% at moderate and 6% at poor overall status. There were no water bodies at high or bad overall status. The catchment is an important salmon and sea trout fishery, and rod catches are variable with a slower decline in salmon numbers than in other catchments. In 2018 the Conwy salmon stock status was “probably at risk” and sea trout stock were “probably not at risk”.

## Results

Clwyd sites were surveyed between June 2017 and April 2018 (in the months of June-August, and 4 sites in January, 2 in February and 1 in April) and otter signs were found at 78% (Table 6). There was a **17% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this was not a statistically significant decline (Table 2 in overall results section).

## OTTER SURVEY OF WALES 2015-2018

Conwy sites were surveyed between May 2017 and April 2018 (in the months of May-October and 1 site in April) and otter signs were found at 57% (Table 7). There was a **39% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2).

Table 6 Clwyd results

Clwyd	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	1/27	14/36	24/36	32/36	34/36	28/36
% positive	4%	39%	67%	89%	94%	78%

Table 7 Conwy results

Conwy	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	1/32	7/36	12/36	28/36	34/36	20/35
% positive	3%	19%	33%	78%	94%	57%

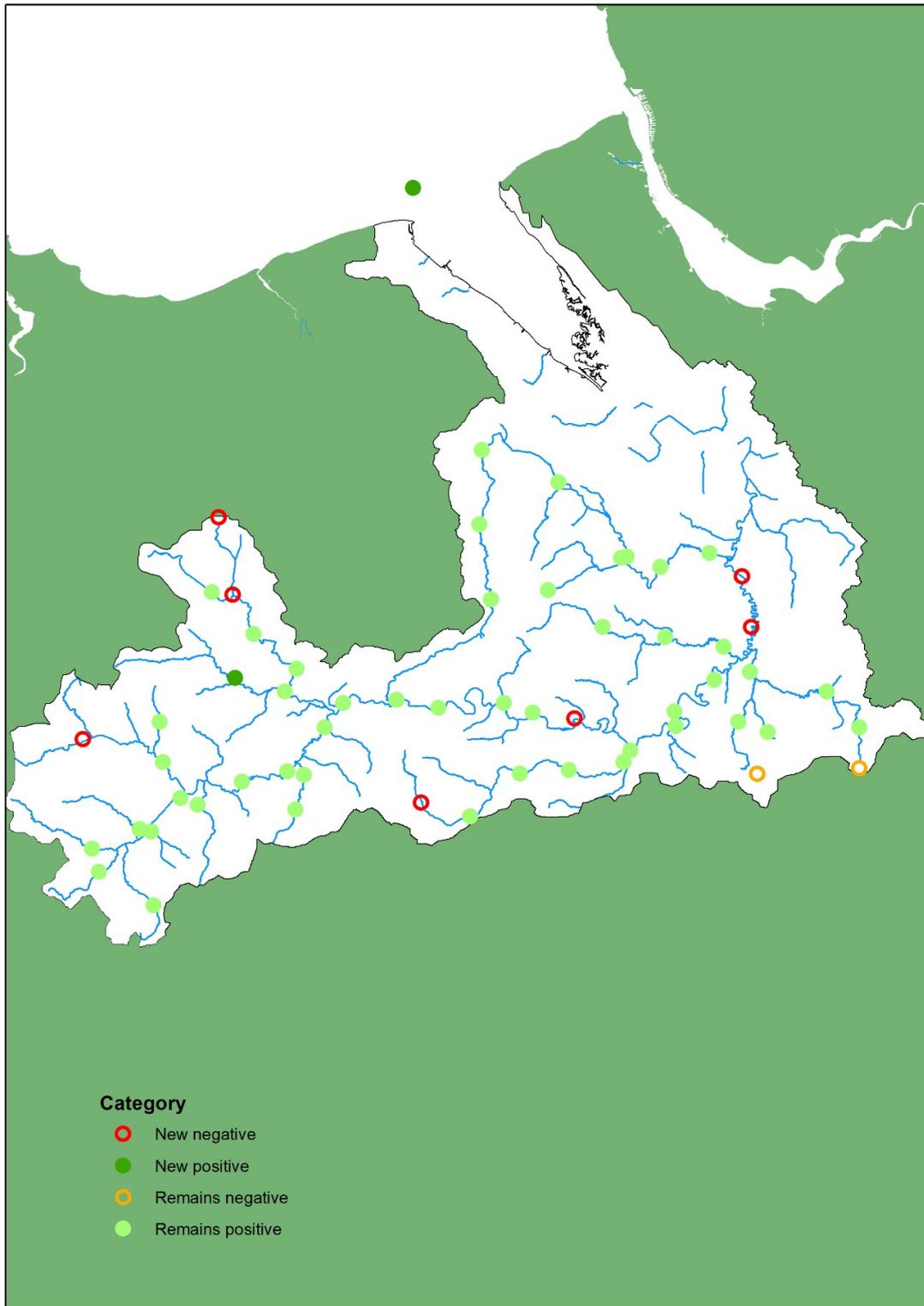
## Discussion

Both the Clwyd and the Conwy had statistically significant declines between 2009-10 and 2017 (Table 2) with the decline in the Conwy much more pronounced (-39%) than the Clwyd (-18%). Most negatives in the Clwyd catchment were in the west of the Clwyd, close to the Conwy catchment which had a higher incidence of negative sites. The Conwy was slower than the Clwyd to recover between the first national survey in the 70s and the last survey in 2009-10. These declines in otter signs are a cause for concern.



Otter near River Ystrad, Clwyd catchment © Tony Pope

## Dee



## Description

The River Dee rises above Bala in the Cambrian Mountains, flows east through the Vale of Llangollen and then turns north towards its estuary in Flintshire and Cheshire. The river flows from Wales to England and back to Wales, in places forming the Welsh/English border. The Upper Dee catchment is largely rural. It includes the main River Dee from its source above Llyn Tegid, in Snowdonia National Park, down through the Vale of Llangollen to the confluence with the Afon Ceiriog. The main areas of population are at Bala, Corwen, Llangollen, Wrexham, Chester and Mold.

Agriculture is the dominant land use, mainly sheep and beef farming with dairy and arable farming in the Cheshire plains. There are some forestry plantations in the uplands. Tourism is an important part of the local economy, including water-based recreation, particularly around Bala and on the Llangollen canal. Fishing for salmon, trout and grayling is also popular in this part of the Dee. The key reservoirs for regulating flows along the length of the Dee are in the upper Dee. These include Llyn Celyn, Brenig Reservoir and Llyn Tegid, as well as Alwen Reservoir which provides a direct water supply.

Urban pressures from development in Wrexham impact biological quality. Rural diffuse pollution from agriculture, physical modification and pollution from waste water also affects the rivers. The Dee and its estuary has a high conservation value, it is designated as two Special Areas of Conservation (SAC), and notified as three separate Sites of Special Scientific Interest (SSSIs), with the otter as a feature of interest. The intertidal habitats of the Dee Estuary are also designated as a Special Protection Area and a Ramsar site.

In 2015, 28% of water bodies were in good or better overall status. 71% of water bodies were given the objective of good status or better to be achieved by 2021, there was a large degree of uncertainty that such a significant increase in achieving good status or better will be observed by 2021. In the Dee RBD; there were no water bodies that deteriorated in overall water body classification between the 2009 baseline and 2015.

Salmon rod catch declined every year between 2010 and 2015 and was still low compared to the 10-year average in 2018. Sea trout rod catches were increasing until 2017 and 2018. In 2018 the salmon stock status was “at risk” and sea trout stock were “probably at risk”.

## Results

Sites were surveyed between June 2017 and April 2018 (1 site in June 2017, 2 in April 2018 and all others in August to November 2017 and February 2018) and otter signs were found at 85% (Table 8). There was a **9% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this was not a statistically significant decline (Table 2 in overall results section).

## OTTER SURVEY OF WALES 2015-2018

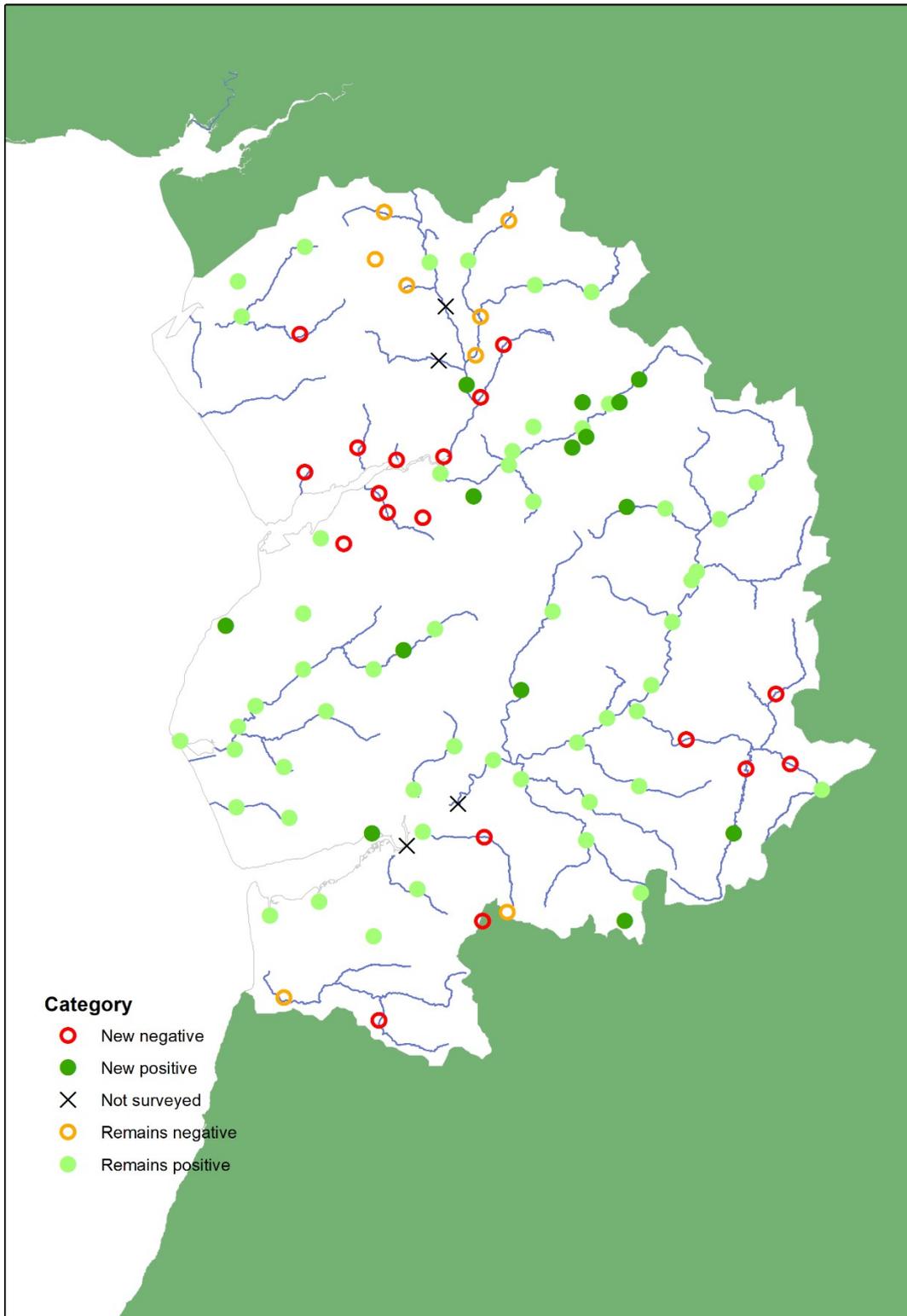
Table 8 Dee results

	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	16/53	24/59	29/59	46/59	55/59	50/59
% positive	30%	41%	49%	78%	93%	85%

### Discussion

A small number of sites (n=7) which had otter field signs in 2009-10 no longer had otter signs in 2017-18, this change was not statistically significant, and the change is within what could be considered normal variation rather than a real decline.

## Dyfi



## Description

Agriculture and forestry are the predominant land uses in the Dyfi hydrometric area, also known as the Meirionnydd Management Catchment.

The area covers the catchments of the Dyfi and the Mawddach, as well as the mountain range of Cadair Idris and a long coastal strip extending south from Harlech. There are large areas of forestry in the Dyfi valley and to the north of Dolgellau, however elsewhere agriculture dominates, predominantly sheep farming in the upland areas. The area has a rich history in mining activity dating back to Roman times and abandoned metal mines give rise to elevated metal concentrations in parts of the catchment. Much of the Meirionnydd catchment area lies within Snowdonia National Park. Wales' only UNESCO biosphere area is in the Dyfi Valley. In the Dyfi biosphere, communities work to balance the conservation of biodiversity with sustainable use of the area. There are several EU bathing waters in this catchment and shellfish beds in the Dyfi and Mawddach estuaries. Tourism is of great economic importance to the area and provides diverse leisure opportunities to enjoy the coastline, mountains and estuaries. There are also many coastal, estuarine and inland sites designated for conservation and biodiversity purposes.

Within this management catchment 39% of surface water bodies were at good overall WFD classification status, 59% at moderate and 3% at poor overall status. There were no water bodies at high or bad overall status.

Salmon rod catch declined substantially in 2013 and has remained low since. The sea trout rod catch is generally very good but was exceptionally poor in 2018, with the worst sea trout rod catch on record. In 2018 the salmon stock status was "at risk" and sea trout stock were "probably at risk".

## Results

Sites were surveyed between July 2017 and February 2018 (with some surveys in each of these months) and otter signs were found at 71% (Table 9). There was a **9% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this decline was not a statistically significant decline (Table 2 in overall results section).

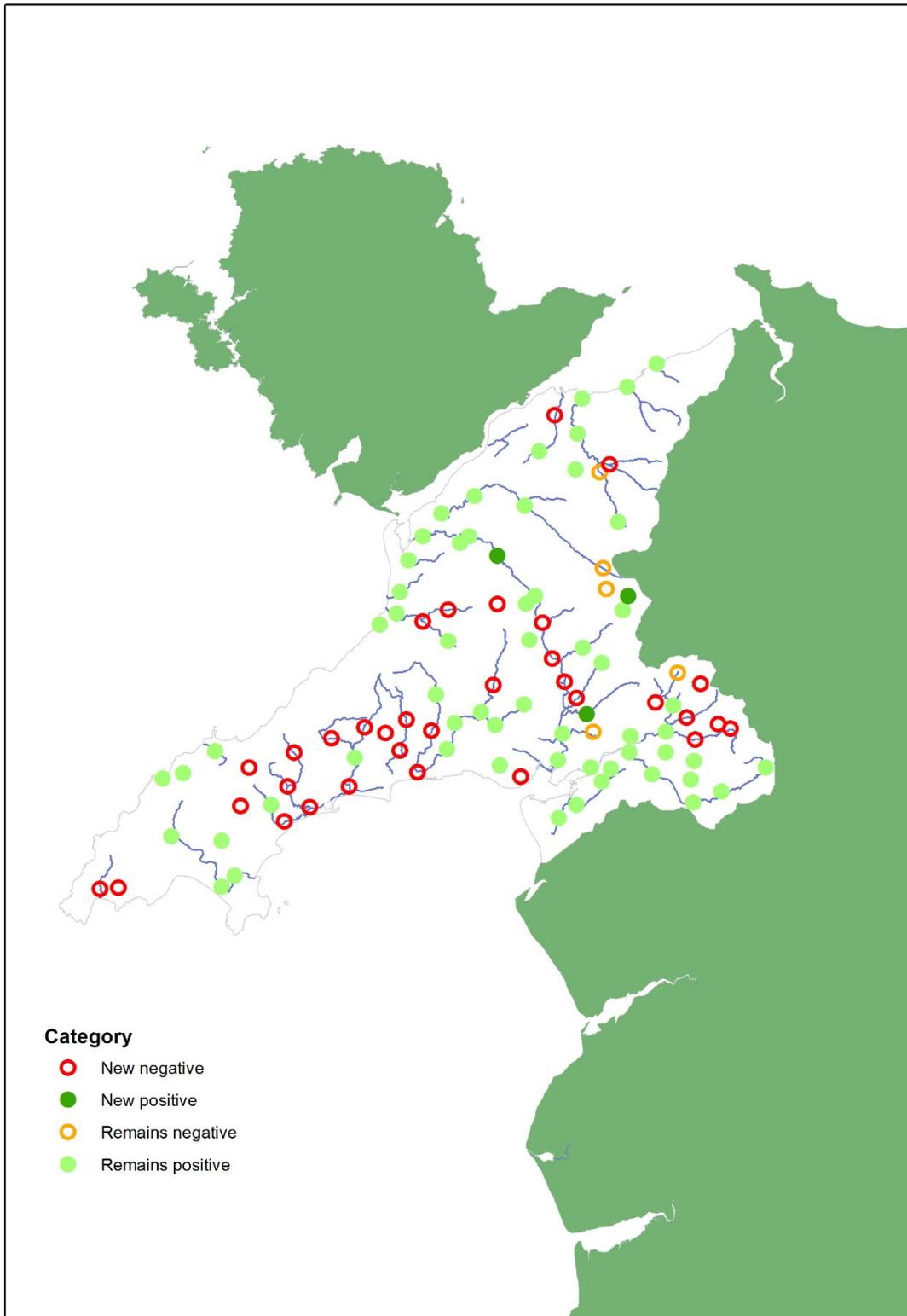
Table 9 Dyfi results

	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	9/97	33/97	49/97	57/97	76/97	66/93
% positive	9%	34%	51%	59%	78%	71%

## Discussion

The small decrease in sites positive for otters was not statistically significant overall for the Dyfi hydrometric area. However, the newly negative sites are clustered, giving cause for concern of localised problems for otters around the Afon Mawddach. Conversely there were also a number of new positive sites in the Wnion. It is not possible to assess if the same animals are involved, we would expect colonisation of the Wnion if habitat is suitable irrespective of any issues on the Mawddach. There is also a smaller cluster of negative sites around the Twymyn.

## Glaslyn



## Description

Also known as the Llŷn and Eryri catchment, the Glaslyn hydrometric area covers the Llŷn Peninsula, extending south east to the Glaslyn estuary and north eastwards to Dwygyfylchi and Snowdonia.

The eastern half is mountainous upland, dominated by sheep farming. Further west on the low-lying land of the Llŷn Peninsula, dairy farming is more common. Outside of Bangor, Caernarfon and Porthmadog, the population is generally scattered in small towns and villages. There are several EU bathing waters around the coastline and commercial shellfish waters along the Menai Strait. Tourism is of great economic importance to the area and maintaining the quality of coastal waters and inland rivers is a high priority. There are also many inland sites designated for conservation and biodiversity purposes, as well as Snowdonia National Park, which are important in attracting tourists to the area.

Within this management catchment in 2015 there were 1% of surface water bodies at high overall WFD classification status, 36% at good, 59% at moderate and 4% at poor overall status. There were no water bodies at bad overall status. Salmon rod catches were higher than the 10 year average in 2010-2013, but have been below average since and very much lower in 2016-2018. Sea trout rod catch have declined 2016-2018. In 2018 the salmon and sea trout stocks status were “probably at risk”.

## Results

Sites were surveyed between July and December 2017 (in the months of July to September and 3 in December) and otter signs were found at 62% (Table 10). There was a **33% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

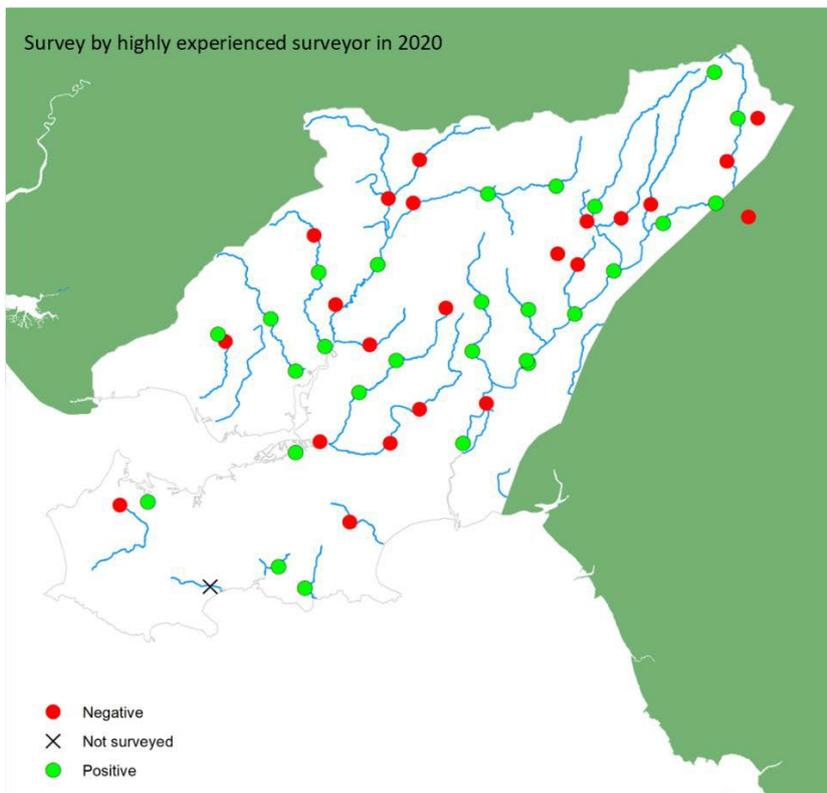
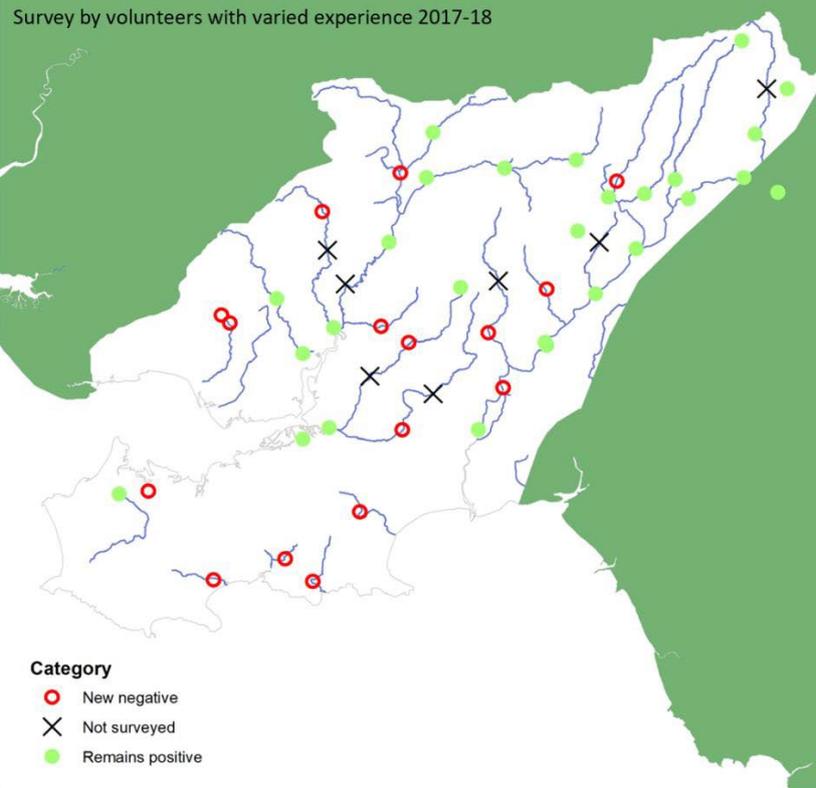
Table 10 Glaslyn results

	1977-78	1984	1991	2002	2009-10	2017
Positive sites (positive/total)	17/93	18/99	20/99	47/99	91/99	61/99
% positive	18%	18%	20%	48%	92%	62%

## Discussion

Several rivers have multiple new negatives, particularly the east of the Llŷn peninsula; Penrhos, Rhyd-Hir, Erch, Wen and Dwyfach. The last otter survey of Wales reported a major expansion into the peninsula (Strachan, 2015), which has now almost been reversed. There is a cluster on the Glaslyn and another around the upper tributaries of the Dwyryd. There is no obvious reason for these clusters.

## Llwchwr/Loughor



## Description

The Loughor hydrometric area is diverse from the Brecon Beacons National Park, large towns (Swansea and Llanelli) and the Gower peninsula. The headwaters of the rivers Loughor and Tawe emanate in the western part of the Brecon Beacons National Park. The coastline of the Gower peninsula has beaches, cliffs and salt marshes.

Some rivers have been confined or rerouted, for example in Llanelli, in order to accommodate urban and industrial developments. The largest town in Carmarthenshire, Llanelli (population ~25,000 as at 2011), is located on the coast. Further to the north and west and on much of Gower, the area is generally rural in nature and more sparsely populated.

Agriculture is primarily dairy and beef farming in the lowlands and beef and sheep in the poorer upland soils. Much of Gower is an Area of Outstanding Natural Beauty and tourism is an important part of the local economy. The Burry Inlet has internationally important numbers of waders and wildfowl and supports an important cockle fishing industry.

Summary data of the overall WFD condition of water bodies in this hydrometric area is not readily available because data are summarised in “Management Catchments summaries” of which the Loughor is included in the Carmarthen Bay catchment summary with the Tywi hydrometric area. The majority of rivers are classed as good or moderate with the exception of the Clyne river on the Gower and the ‘Loughor-confluence with Aman to tidal limit’ which were classed as poor in 2018. The transitional waters of the Bury inlet were also classed as poor in the 2015 and 2018 classification.

Declared salmon rod catch for the last 10 years has been variable with the highest catch in 2010 and much lower catches each year since 2012. Declared sea trout rod catch has also been variable over the last 10 years, the highest recorded catches were in 2009, 2010 and 2012. In 2018 the sea trout stocks status were “at risk”, salmon rod catches were too low to assess the stock status.

## Results

Sites were surveyed between November 2017 and April 2018 (in the months of November, December, February, March and 1 in April) and otter signs were found at 63% (Table 11). There was a **37% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section). The Loughor was resurveyed by the highly experienced surveyor Andrew Crawford in January and February 2020 (see verification section for details). Mr Crawford found 57% of sites positive for otter signs, even less than the volunteers in 2017-18 (Table 11).

## OTTER SURVEY OF WALES 2015-2018

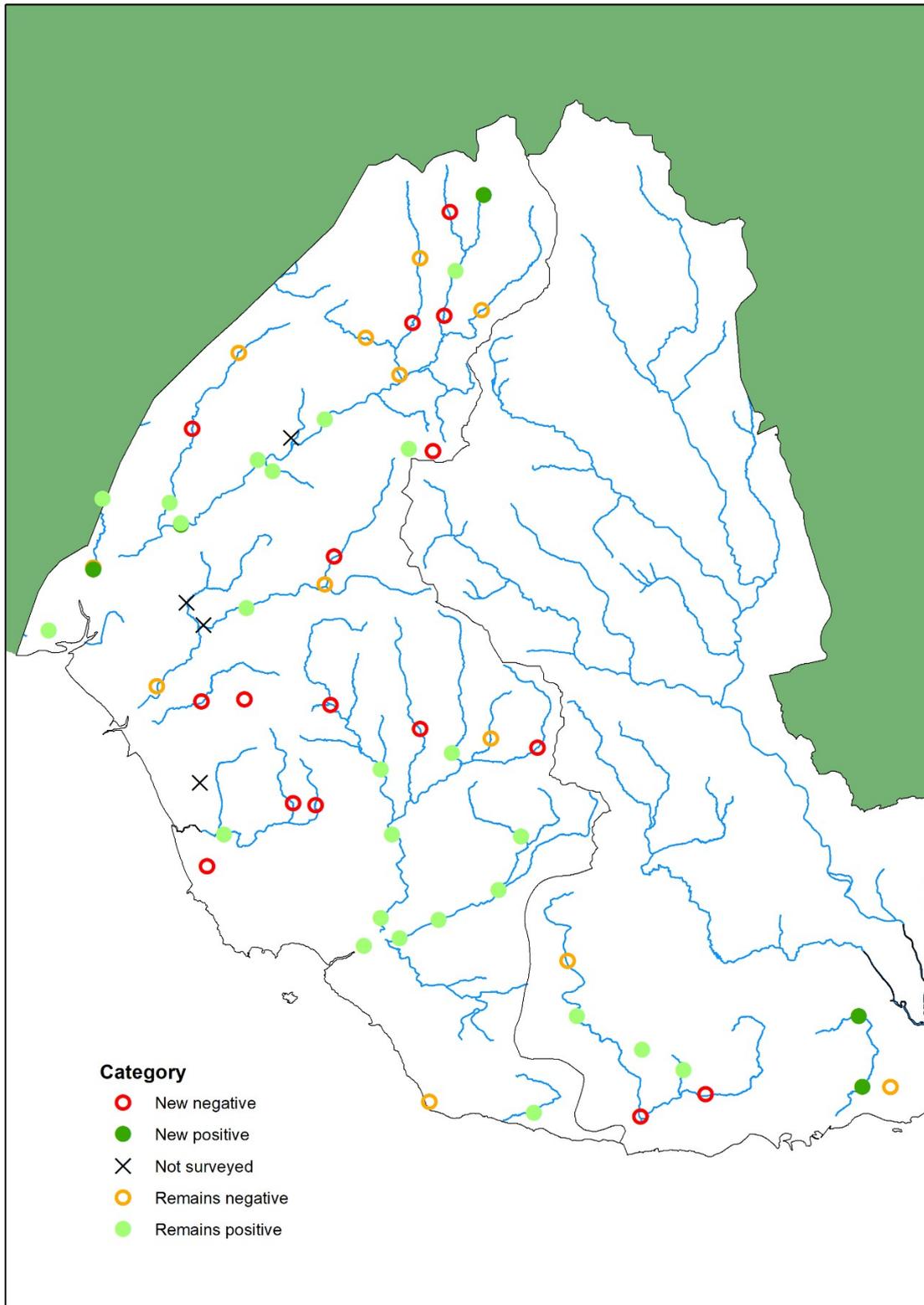
Table 11 Loughor results

	1977-78	1984	1991	2002	2009-10	2017-18	2020
Positive sites (positive/total)	0/47	0/50	22/50	39/50	50/50	27/43	28/49
% positive	0%	0%	44%	78%	100%	63%	57%

### Discussion

Newly negative sites are spatially widespread throughout this hydrometric area. The coastal streams of the southern Gower are particularly affected with no otter signs recorded. The Loughor was characterised by a remarkable recovery previously, from 0-100% sites positive in 25 years. This suggests there is potential to reverse the decline described here in a relatively short period, although the cause for the current decline is not clear. Furthermore, Mr Crawford noted that during his survey in 2020 that in many cases it was necessary to survey considerable distances to find any otter signs. In his opinion, the results raise serious concerns and indicate an otter population which has for some reason declined considerably.

## Morganwg Canol/Mid Glamorgan



## Description

The Neath, Afan, Kenfig, Ogmore, Thaw and Cadoxton rivers are in the Mid Glamorgan hydrometric area. The Neath emanates in the Brecon Beacons National Park and as a result of urban and industrial developments has been confined or re-routed in places. There are major industrial estates in Neath, Port Talbot and Bridgend and large industry such as Tata Steel at Port Talbot and Ford at Bridgend. Away from the coast, forestry is an important land-use, particularly coniferous plantations in the upper part of the Neath, Afan and Ogmore catchments where there is almost complete coverage of the steep valley sides, in particular Rheola, Margam, Ogmore and Afan forests. Increasingly, a deciduous mix is planted after harvesting the existing timber, especially along river corridors, in order to enhance biodiversity and protect water quality.

Agricultural activity in the upland areas of the Brecon Beacons is largely restricted to sheep farming on unimproved grassland with some beef cattle rearing. The lower lying areas, particularly in the Vale of Glamorgan, are more fertile and support dairy units, arable farming and beef cattle rearing.

Summary data of the overall WFD condition of water bodies in this hydrometric area is not readily available because data are summarised in “Management Catchments summaries” and the Mid Glamorgan is split into several of these. Most waterbodies were classed as moderate or good in the 2015 WFD classification, with only three classed as poor. No waterbodies had a bad or high overall status.

The Afan supports a locally important salmon and sea trout (sewin) fishery. Sea trout are the principal salmonid, with a limited number of salmon also present. In 2018 the sea trout stocks status were “at risk”, salmon rod catches were too low to assess the stock status.

The Neath supports a locally important salmon and sea trout (sewin) fishery. Sea trout are the principal salmonid, with reasonable numbers of salmon also present. Declines in salmon rod catches since 2011 and far fewer sea trout caught in 2015-2018 than in previous years. In 2018 the sea trout stocks status were “at risk”, salmon rod catches were too low to assess the stock status.

The Ogmore river now supports a locally important fishery consisting mainly of brown trout and sea trout. The rod catches of salmon have been much lower in recent years than in 2010. In 2018 the salmon stock status was “at risk” and sea trout stock were “probably at risk”.

## Results

Sites were surveyed between September 2017 and February 2018 (in the months of October and November, 1 site in September, 2 in December, 3 in February) and otter signs were found at 51% (Table 12). There was a **28% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

## OTTER SURVEY OF WALES 2015-2018

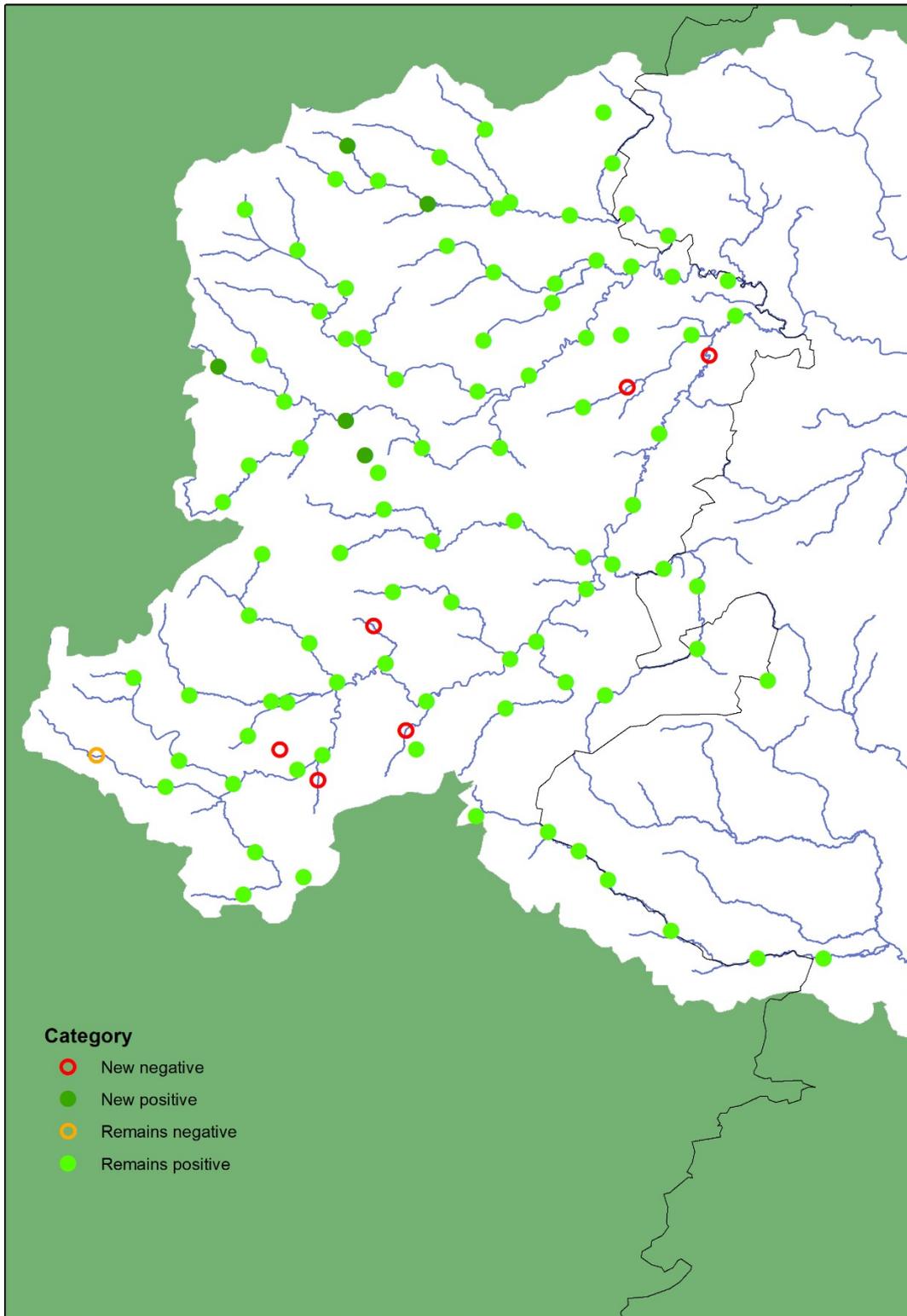
Table 12 Mid-Glamorgan results

	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	1/53	0/61	1/61	11/61	43/61	29/57
% positive	2%	0%	2%	18%	70.5%	51%

### Discussion

Mid-Glamorgan had the second lowest (behind Anglesey) proportion of positive sites in the 1991, 2002, 2009-10 surveys. Number of positive sites remained very low up to 2002 with a remarkable recovery found in the 2009-10 survey, the highest percentage increase of all the hydrometric areas. Although the newly negative sites do not return the area to 2002 levels, they are spatially widespread throughout. The lower Ogmore sites remain positive, but the higher reaches do not. Similarly, the higher reaches and tributaries of the Neath are dominated by negative sites. These areas are moorland, with some extensive coniferous plantations. Conversely the lowland Cadoxton has improved with two out of three sites now positive.

## Severn



## Description

The majority of the Severn hydrometric area is in England. Rising near Pumlumon, in the Cambrian Mountains, the River Severn flows in a north-easterly direction through the conifer clad Hafren Forest and a broad rural valley into Shropshire. The upper Severn area is dominated by sheep farming, serviced by four market towns, Oswestry, Llanidloes, Welshpool and Newtown. The catchment includes the Clywedog and Vyrnwy reservoirs in the west and the rivers Severn and Vyrnwy, as well as a collection of many small tributaries. The conservation value of the catchment is high, with a large number of designated sites. The Shropshire Union Canal, which is a SAC, follows the Severn from Newtown to Pool Quay.

The tributaries have been described as supporting a diverse range of ecology associated with good water quality. However, the many waters are impacted by acid or sediment run-off or drainage from abandoned metal mines. The fish communities are dominated by brown trout and migratory Atlantic salmon and the tributaries of the Severn provide important spawning grounds for both species. The distribution of salmon is limited by the presence of obstacles such as waterfalls or weirs. However, many of the artificial barriers that limited salmon have been identified by the Severn Rivers Trust to be targeted for fish passes.

No catchment summary report exists for the Severn. WFD reporting for the Severn has been summarised by river basin district (RBD) which includes the Severn, Wye and Taff hydrometric areas. In 2009 37% of water bodies in the Welsh section of the Severn RBD achieved good or better overall WFD status. The 2015 classification results indicate that 43% of all water bodies achieved good or better status.

Rod catches separated for the Welsh section of the Severn only were not available. Salmon and trout fry were higher in the Upper Severn, but parr were lower in 2017 than the previous five year average (2011-2015 because 2016 was an exceptionally bad year). In 2018 the salmon and sea trout stocks status were “probably at risk”.

## Results

Sites were mainly surveyed in the months of May-June in 2015 and 2016, one site was surveyed in August 2017 and one site was surveyed in November 2017. Otter signs were found at 93% of sites (Table 13). There was a **1% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this was not a statistically significant decline (Table 2 in overall results section).

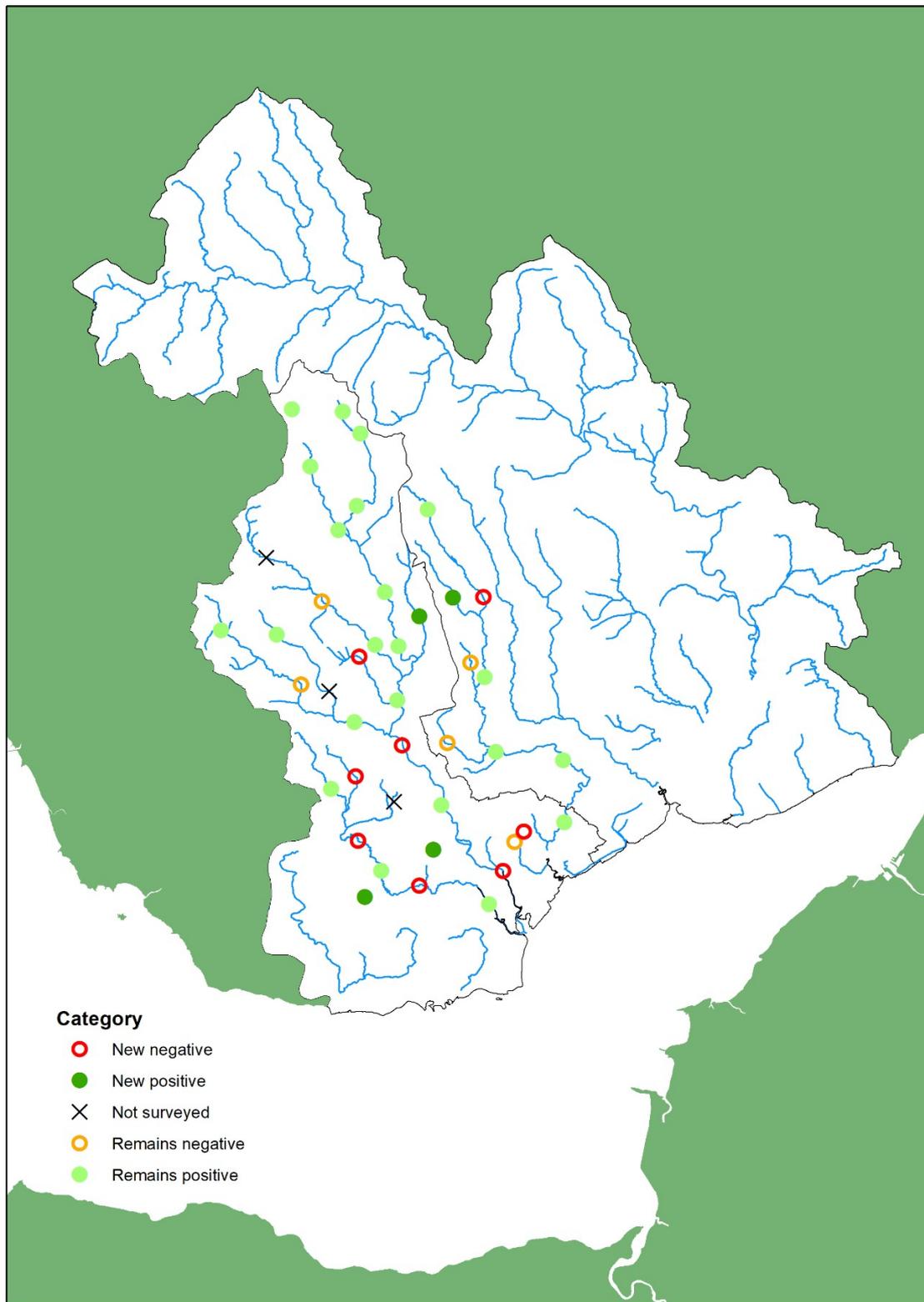
Table 13 Severn results

	1977-78	1984	1991	2002	2009-10	2015-17
Positive sites (positive/total)	40/101	68/101	75/101	87/101	95/101	94/101
% positive	40%	67%	74%	86%	94%	93%

## Discussion

The Welsh part of the Severn hydrometric area has maintained almost all positive sites. The small number of negatives are not in the same locations as the 2009-10 survey but it is reasonable to assume this minor fluctuation does not represent a significant change for the otter population. It was likely that this population of otters, along with those from the Wye, helped to drive the recovery in much of England. It could now be described as a stronghold, when compared to the declines recorded in this survey in other areas across Wales. It should be noted that the results for this hydrometric area are for the uplands only, i.e. the Welsh section.

## Taff



## Description

The Taff river is in the South East Valleys management catchment along with the Rhymney and Ely rivers, which all discharge to the Severn Estuary. The major urban centres include Aberdare, Caerphilly, Merthyr Tydfil, Pontypridd and Cardiff, which has an important commercial port. The 'valleys' rivers begin high in the Brecon Beacons and flow through steep-sided valleys to the low-lying coastal areas of Cardiff. The valley slopes have managed grassland and forest. While many of the rivers have recovered from historical degradation caused by the iron, coal and other industries, the narrow valley floors mean that industrial and urban development has tended to lie close to the banks of the rivers, resulting in extensive man made changes, loss of riverside habitats and leaving rivers vulnerable to urban pollution.

Through a prioritised programme of fish pass construction and weir removal involving Natural Resources Wales, Cardiff Harbour Authority, Groundwork and South East Wales Rivers Trust, most rivers are now accessible to migratory fish and work is ongoing to make sure fish can access spawning areas higher up the rivers and their tributaries. Further modifications took place at the lower end of the catchment when Cardiff Bay was created in 2000 by fully impounding the Rivers Taff and Ely. In the upper catchment, the headwaters of the Taff have been modified by a series of dams and reservoirs to supply water to the industries and residents of South Wales. Natural Resources Wales and Dŵr Cymru Welsh Water are working to balance the impact on the natural environment from the dams and reservoirs in the catchment whilst securing the valuable water supply.

In the 2015 WFD classification, within the South East Valleys Management Catchment 20% of surface waters are at good overall status, 65% at moderate, 13% at poor and 2% at bad. There are no surface water bodies at high overall status. Note that the South East Valleys Management Catchment includes the Eddw and Sirhowy rivers, whereas for OSW these rivers are in the Usk hydrometric area. A "Know Your Rivers" report has not been written recently for the Taff. In 2018 the salmon and sea trout stocks status were "at risk".



Otter at Llwyn Onn reservoir © Kerry Thomas

## Results

Sites were surveyed between June and October 2017 and otter signs were found at 65% (Table 14). There was a **15% decline** in the number of sites where otter signs were found since the last survey in 2009-10 but this was not a statistically significant decline (Table 2 in overall results section).

Table 14 Taff results

	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	0/21	2/42	7/42	21/42	33/42	26/40
% positive	0%	5%	17%	50%	79%	65%

## Discussion

Negative sites are spread throughout the Taff hydrometric area with the exception of the upper reaches of the Taff, where there is excellent habitat around reservoirs. Although quality of habitat does not seem to explain the pattern of positive sites elsewhere.

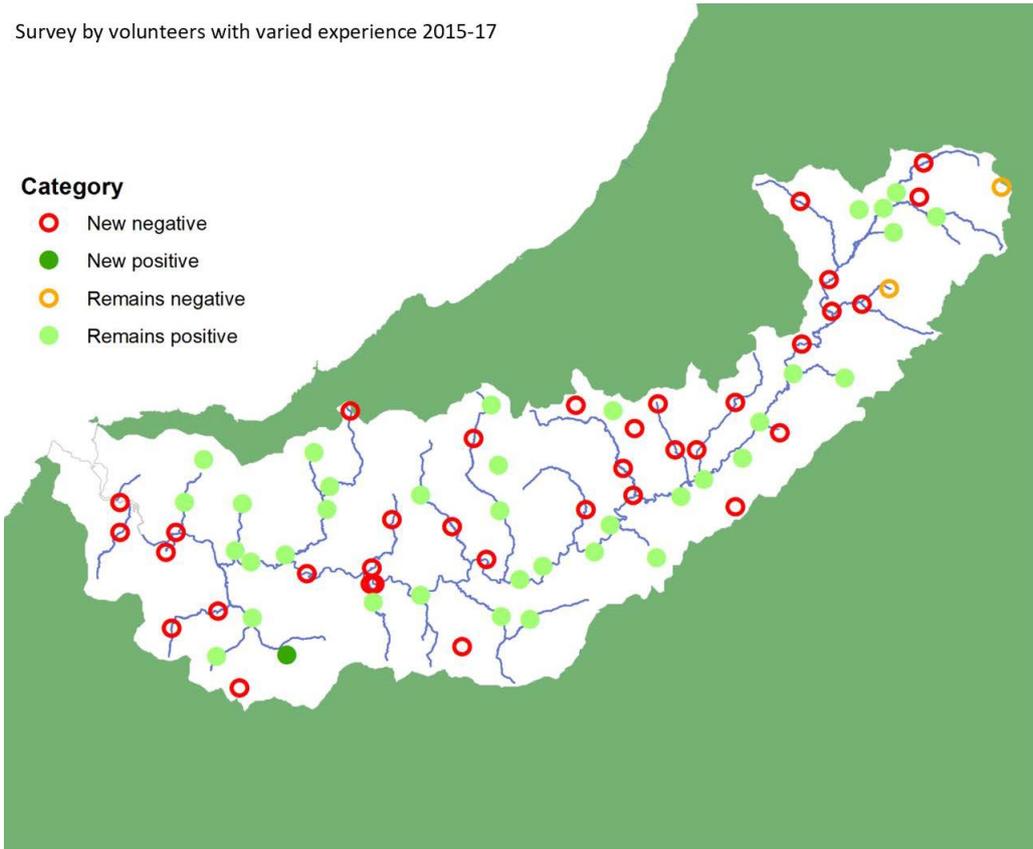
# OTTER SURVEY OF WALES 2015-2018

## Teifi

Survey by volunteers with varied experience 2015-17

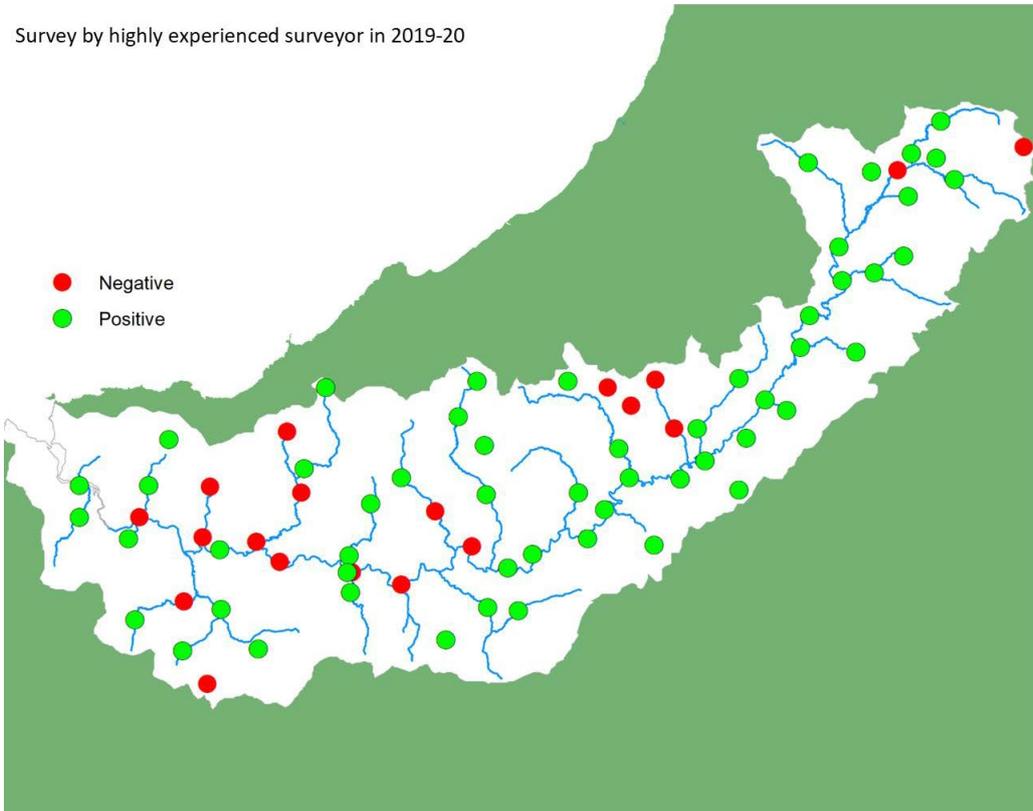
### Category

- New negative
- New positive
- Remains negative
- Remains positive



Survey by highly experienced surveyor in 2019-20

- Negative
- Positive



## Description

The larger urban areas in this hydrometric area are Cardigan on the coast and Lampeter, 10 miles inland on the Teifi. The Teifi, at 122km, is one of the longest rivers in South West Wales. Its source is Llyn Teifi in the Cambrian Mountains from where it descends steeply through moorland and forestry to the geologically and ecologically important basin of Cors Caron. The river continues through rural areas largely supporting dairy and mixed stock farms. Rocky, tree-lined sections are a feature of the catchment and a number of impressive gorges, particularly at Maesydrugiau, Alltycafan and Cilgerran, add significant environmental and landscape value. The falls on the Teifi at Cenarth are a spectacular attraction under high flows and are famous as a location for watching salmon leaping and elvers migrating.

The Teifi valley is mainly rural with agriculture and forestry accounting for the majority of land usage. Large dairy units predominate in the lower reaches of the Teifi, with mixed dairy and livestock rearing present in the middle reaches. In the upper area, the poorer soil conditions restrict agriculture to livestock rearing on rough grazing and improved pastures. The Teifi is designated as a Special Area of Conservation. It flows through Cors Caron, a lowland raised bog with a distinctive plant community and aquatic invertebrates unique to the area.

Summary data of the overall WFD condition of water bodies in this hydrometric area is not readily available because data are summarised in “Management Catchments summaries” and the Teifi hydrometric area is summarised with others in “The Teifi and North Ceredigion management Catchment”. In the 2015 WFD classification most waterbodies within the Teifi hydrometric area were classified as moderate, with several tributaries and a main part of the Teifi classified as good. Four short tributaries near Cardigan were classified as poor.

The Teifi supports a nationally important salmon and sea trout (sewin) fishery, which includes one of the few remaining coracle fisheries in the UK. Sea trout are the predominant migratory salmonid, with a large number of salmon also reported, however these are at risk. Salmon rod catches declined steadily between 2010 and 2018, in contrast net catches did not. Sea trout rod catches did not show a consistent trend over time. In 2018, both the salmon and sea trout stocks status were “at risk”.

## Results

Sites were surveyed in July-August 2015 and August-September 2017 and otter signs were found at 50% (Table 15). There was a **48% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section). The Teifi was resurveyed by the highly experienced surveyor Andrew Crawford in December 2019 and January 2020 (see verification section for details). Mr Crawford found 74% of sites positive for otter signs, 18 more sites than the volunteers in 2017-18 (Table 15).

## OTTER SURVEY OF WALES 2015-2018

Table 15 Teifi results

	1977-78	1984	1991	2002	2009-10	2015-17	2019-20
Positive sites (positive/total)	28/73	29/75	44/75	72/74	71/74	37/74	55/74
% positive	38%	39%	59%	97%	96%	50%	74%



Otter on the river Teifi © Jeff Chard

### Discussion

The 2015-17 survey of the Teifi hydrometric area indicated a drastic reduction in the number of sites containing otter signs. Due to the scale of the decline since 2009-10, it is very likely that this did represent a reduction in the size of the local otter population. The newly negative sites were widespread and not clustered. There were many tributaries with no positive otter sites.

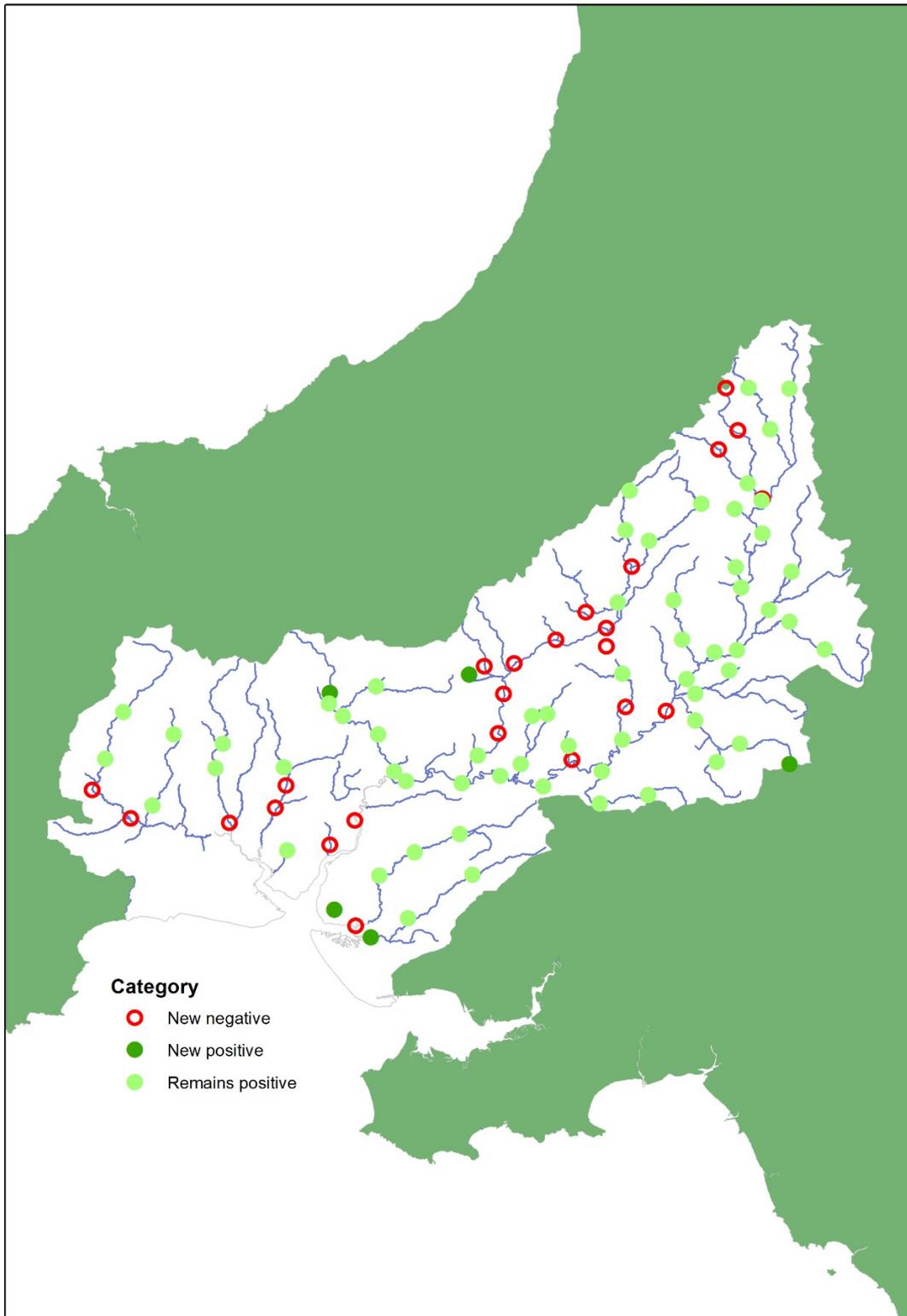
Consultant Geoff Liles reported the Teifi as being favourable conservation status for otters (Liles, 2006) but in 2012 he reported many sites as highly disturbed e.g. by dogs or trampling from stock (Liles, 2012). Concurrent declines in declared rod catches and salmon returning stock estimates (CEFAS, EA and NRW, 2020) suggest fish declines may be a contributory factor in the decline in otter signs in this

## OTTER SURVEY OF WALES 2015-2018

survey. Pollution incidents may also contribute, such as a large slurry leak from an anaerobic digester in December 2016 resulting in approximately 18,000 fish deaths over five miles.

Whatever caused the decline between 2009-10 and 2015-17, there was some recovery by the 2019-20 survey, however, this was still lower than would be expected. Furthermore, Mr Crawford noted that during his survey in 2019-2020 that in many cases it was necessary to survey considerable distances to find any otter signs and all that was found was old spraint. In his opinion, the results do not indicate an otter population at or near carrying capacity and this is extremely worrying.

## Tywi



## Description

The source of the Tywi is in the southern foothills of the Cambrian Mountains. This predominantly rural area contains a wide variety of landscape types from well-wooded, steep valleys and low-lying river floodplains to the estuaries and coastal landscapes of Carmarthen Bay. With its fertile land and agricultural produce, Carmarthenshire is known as the "Garden of Wales". Much of the existing development, particularly to the south of the catchment, has taken place on the flat areas of land in the valley bottoms adjacent to major watercourses. This is notable along the Amman valley, also at Whitland, Carmarthen and Llandeilo. Further to the north and west, the area is generally rural in nature and more sparsely populated.

Agriculture is the principal land-use within the area, with dairy and beef farming predominating in the lowlands. The poorer soils of the uplands support beef and sheep livestock rearing. Forestry is also an important land-use, especially in the upper Tywi catchment. The Tywi is in fact the longest river in Wales and is renowned as one of the best sea trout rivers in the UK.

The headwaters of the Tywi and Camddwr are dammed forming Llyn Brienne reservoir. Llyn Brienne is operated as a regulating reservoir to support abstractions of river water, particularly at Nantgaredig, and is thereby a major source for potable water supply by Dŵr Cymru Welsh Water to a large part of South Wales.

The Carmarthen Bay and Estuaries and most of the Tywi are designated as Special Areas of Conservation. The unspoilt natural landscape attracts many visitors to the region. In fact tourism is a vital component of the economy of this area, with £355 million in tourist revenue generated in 2011 for Carmarthenshire alone.

Summary data of the overall WFD condition of water bodies in this hydrometric area is not readily available because data are summarised in "Management Catchments summaries" of which the Tywi is included in the Carmarthen Bay catchment summary with the Loughor hydrometric area. In the 2015 WFD classification many waterbodies in this hydrometric area had overall status of moderate or good. The headlands of the Tywi were classified as poor.

The Tywi supports a nationally important salmon and sea trout (sewin) fishery. Sea trout are the predominant salmonid, with a large number of salmon also reported. The salmon rod catch between 2010 and 2018 was highest in 2010 and lowest in 2018, net catches were variable. Declared sea trout rod catches were also variable, although reported rod and net catches have shown an overall decline over the past 10 years. In 2018 the salmon stock status was "probably at risk" and sea trout stock were "at risk".

## Results

Sites were surveyed between May and July in 2015, 2016 and 2017, apart from one site that was surveyed in October 2017. Otter signs were found at 73% of sites (Table 16). There was a **22% decline** in the number of sites where otter signs were

## OTTER SURVEY OF WALES 2015-2018

found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

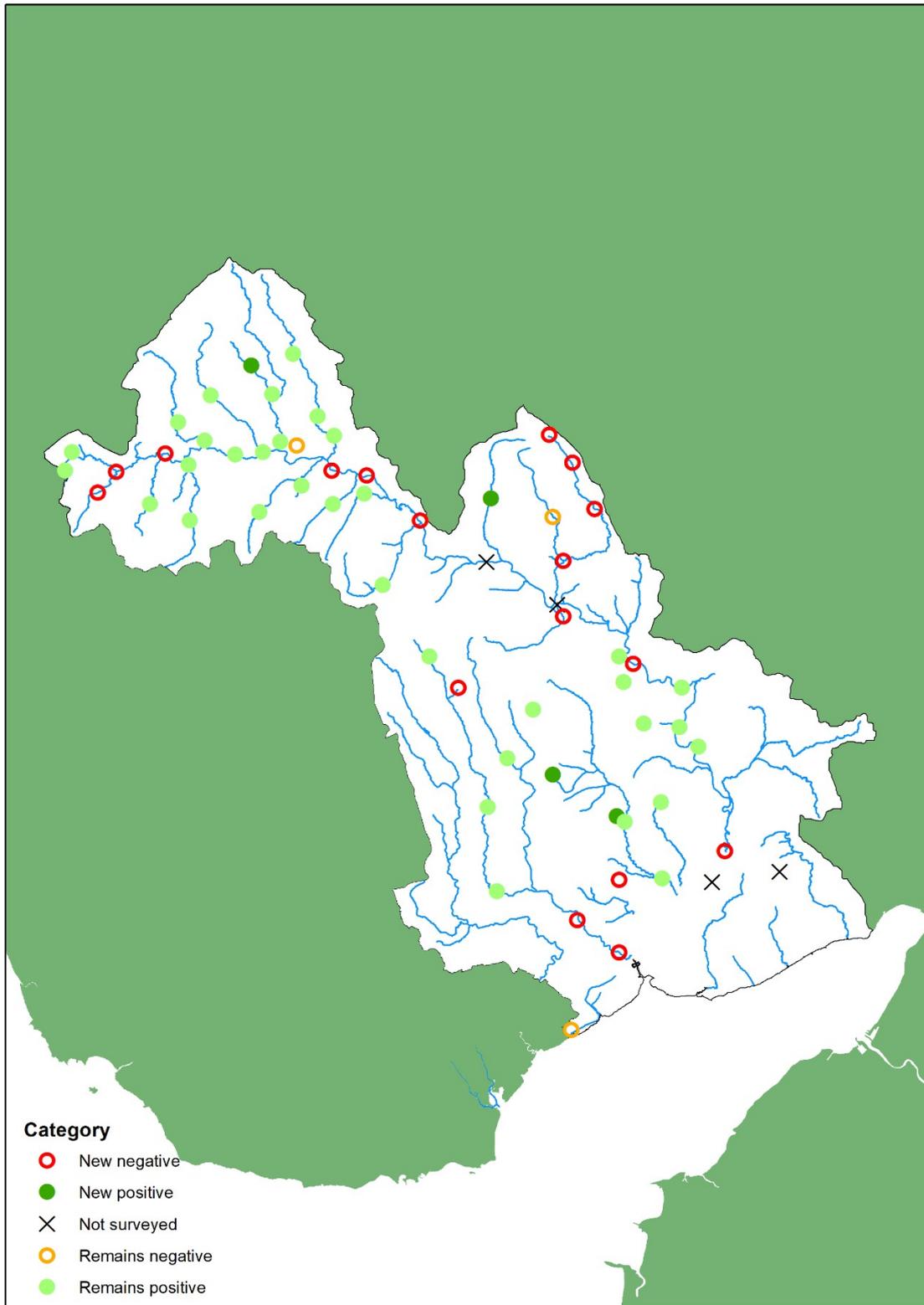
Table 16 Tywi result

	1977-78	1984	1991	2002	2009-10	2015-17
Positive sites (positive/total)	12/87	60/89	63/90	68/90	85/90	66/90
% positive	14%	67%	70%	76%	94%	73%

### Discussion

The newly negative sites are more clustered in the Tywi hydrometric area than in many others. Several negative sites are in the main river while the headwaters remain positive. The main cluster of eight negative sites were on the Cothi to its confluence with the main river Tywi. The Tywi was previously known as one of the best rivers in Wales for otters, and despite declines in otter signs, these clusters suggest that recovery is highly likely if the cause for those declines can be identified and remedied.

## Usk



## Description

The River Usk rises on the northern slopes of the Black Mountain and flows in a long narrow catchment of great scenic beauty for approximately 125km south easterly through the towns of Brecon, Crickhowell, Abergavenny and Usk, before discharging to the Usk estuary at Newbridge and then to the Severn estuary at Newport. The catchment includes the Gwent Levels to the south; a large area of reclaimed coastal grasslands of historical and nature conservation importance. Tourism is important to the local economy, with the Brecon Beacons National Park and the Monmouthshire and Brecon Canal attracting visitors in search of outdoor recreation. This high ecological value is recognised through national and international designations.

Land is predominantly used for agriculture, with sheep farming in the northern and western uplands, and beef, dairy, mixed and arable farming in the lowlands of the south and east. As a result, pollution from rural sources is a major threat to the quality of wildlife living in the water environment. There is some limited industry in the major towns, and Newport has a commercial port.

The headwaters and some of its tributaries are modified by dams to create the Usk, Crai, Talybont and Grwyne Fawr reservoirs. At Brecon some of the river's flow is diverted to feed the Monmouthshire and Brecon Canal and water from the lower River Usk is pumped to Llandegfedd water storage reservoir. Gwent Levels are controlled by tidal flaps, sluices and weirs but are known to hold some populations of coarse fish and eels.

The river Usk and its major tributaries are designated a riverine SAC under the Habitats Directive for several rare or threatened nationally and internationally important species. These species include seven fish species - Atlantic salmon; allis and twaite shad; brook, river and sea lamprey; and bullhead. Salmon rod catch were variable 2010 to 2017 but were extremely low in 2018. There is a small amount of sea trout fishing, but the Usk is better known as an important brown trout fishery. In 2018 the salmon stock status was "probably at risk" and sea trout stock were "at risk".

In the 2015 WFD classification, within this management catchment 33% of surface water bodies are at good overall classification status, 59% at moderate and 9% at poor overall status. There are no water bodies at high or bad overall status.

## Results

All sites were surveyed in summer months June to September in the years 2015 and 2017 and otter signs were found at 66% (Table 17). There was a **26% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

## OTTER SURVEY OF WALES 2015-2018

Table 17 Usk results

	1977-78	1984	1991	2002	2009-10	2015-17
Positive sites (positive/total)	6/56	18/62	34/62	48/60	55/62	38/58
% positive	11%	29%	55%	80%	89%	66%

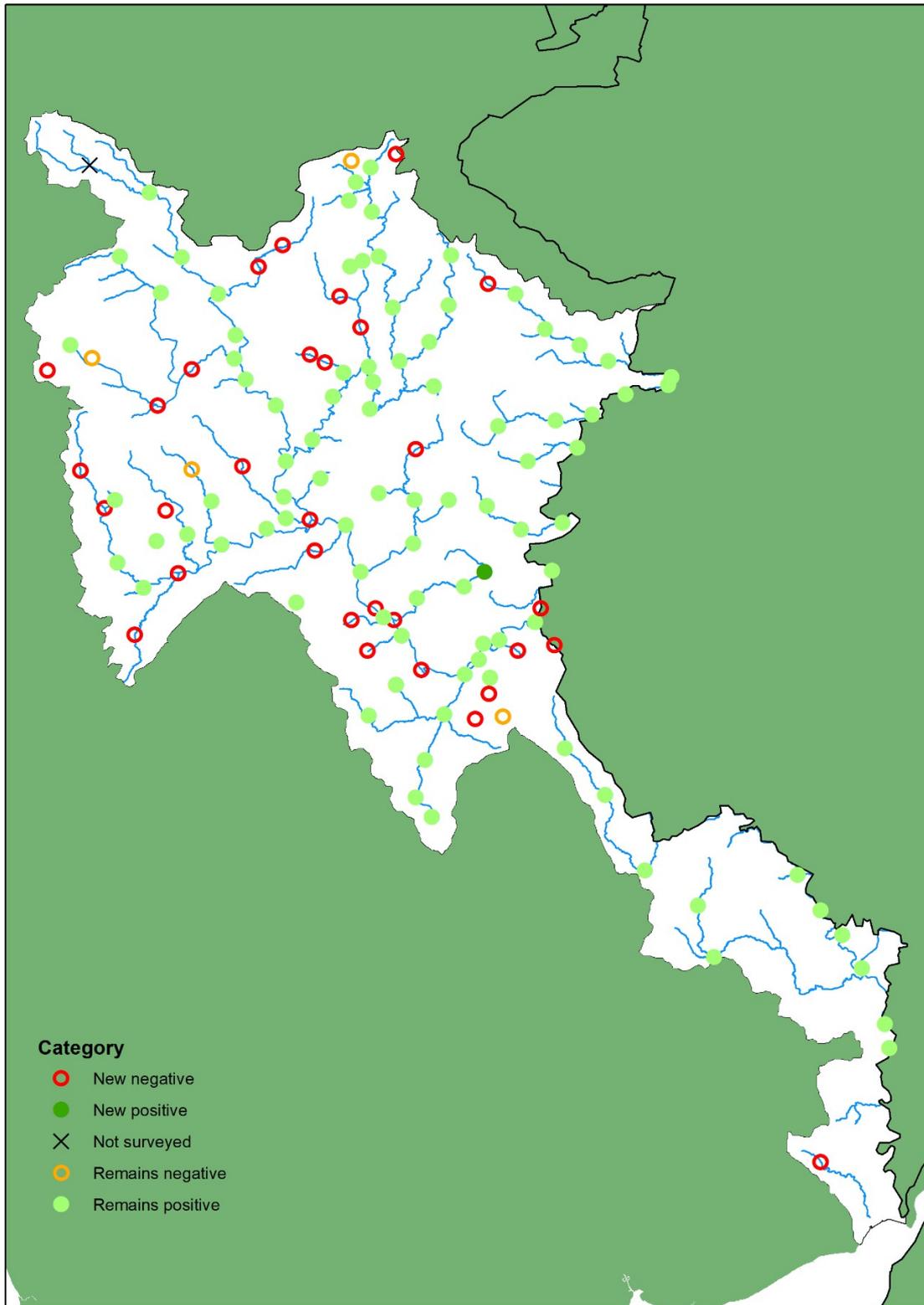
### Discussion

Negative sites are clustered close to the city of Newport, however frequent reports of otters, including a female with cubs, are recorded at RSPB Newport Wetlands. Grwyne-Frechan and Grwyne Fawr have no positive signs, and there were many negative sites between Abergavenny and Brecon.



Otter with swans at Newport Wetlands © Jeff Chard

## Wye



## Description

Rising on the eastern slopes of Pumlumon in the Cambrian Mountains, the River Wye flows in a south-easterly direction through Llangurig, Rhayader and Builth Wells to enter England at Hay-on Wye. It then flows through a major floodplain and the town of Hereford. In its lower reaches it forms the boundary between Wales and England and finally joins the Severn estuary below Chepstow. The Wye's major tributaries are the Ithon, Irfon, Elan, Monnow (which flows into Herefordshire) and the Lugg. The Lugg rises in Wales, but for most of its course flows through England to its confluence with the Wye downstream of Hereford. There is some industry based around major towns such as Monmouth and Chepstow. However, the main land-use throughout is agriculture, with livestock farming dominating in the upper reaches and more intensive arable farming in the lower parts of the catchment. There is also some forestry in the upper reaches. This, combined with the naturally base-poor geology of the western part of the catchment, means that the Irfon and Elan sub-catchment are vulnerable to acidification.

The Wye and several tributaries are a riverine SSSI and Special Area of Conservation with otter a primary feature of special interest, together with Atlantic Salmon, Sea Lamprey, River Lamprey, Brook Lamprey, Twaite Shad, Allis Shad, Bullhead and White-clawed Crayfish. The area offers many opportunities for water-based recreation. The Wye is a well-established and nationally significant salmon rod fishery. However, the salmon runs have declined significantly, and much effort is being expended on the restoration of the fishery through organisations such as NRW and the Wye & Usk Foundation. Since 2012 rod catches had been stabilising but dropped again substantially in 2018. A small number of sea trout are caught on the Wye. The River Wye and its tributaries are also a locally important brown trout, coarse fish and grayling fishery. Elver fishing takes place within the tidal reaches of the Wye. In 2018 both the salmon and sea trout stocks status were “probably at risk”.

No catchment summary report exists for the Wye. WFD reporting for the Severn has been summarised by river basin district (RBD) which includes the Severn, Wye and Taff hydrometric areas. In 2009 37% of water bodies in the Welsh section of the Severn RBD achieved good or better overall WFD status. The 2015 classification results indicate that 43% of all water bodies now achieved good or better status.

## Results

Sites were surveyed between May 2015 and November 2017 (in the months of May-September and one site in November) and otter signs were found at 73% (Table 18). There was a **24% decline** in the number of sites where otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

## OTTER SURVEY OF WALES 2015-2018

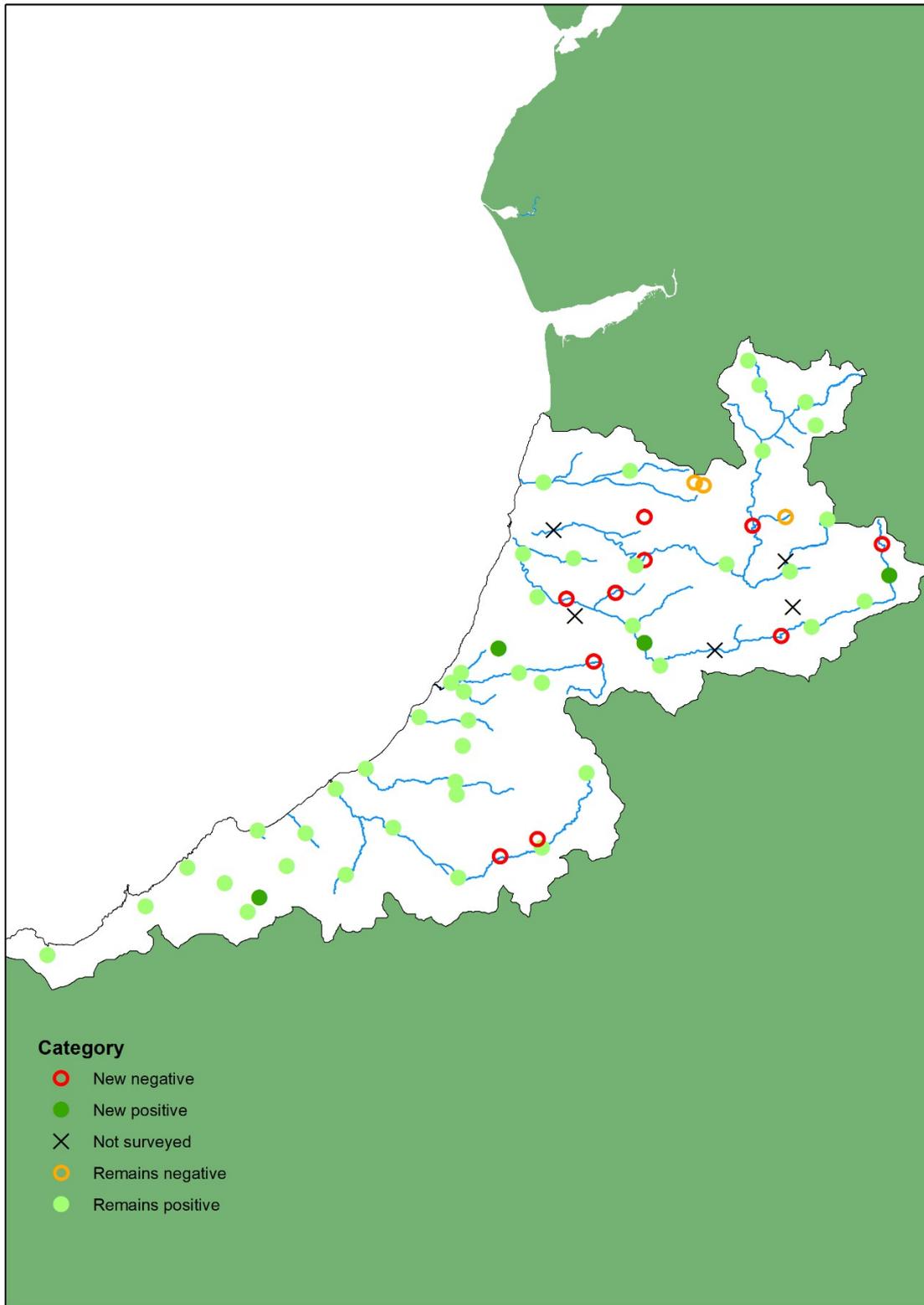
Table 18 Wye results

	1977-78	1984	1991	2002	2009-10	2015-17
Positive sites (positive/total)	28/118	73/118	100/122	112/122	124/129	93/128
% positive	24%	62%	82%	92%	96%	73%

### Discussion

The lower Wye where it is wider and runs through the Wye valley AONB, along with the Trothy remain positive for otter signs. Negative sites are spatially widespread throughout the upper Wye with no clear reason why. There have been recent concerns about phosphate levels and pollution incidents in the Wye but it is not yet clear if these contribute to the decline in otter signs.

## Ystwyth



## Description

The Ystwyth hydrometric area comprises the Rheidol, Ystwyth and Aeron rivers together with numerous smaller coastal rivers and streams that discharge directly into Cardigan Bay. The largest towns and main centres of commerce and tourism in the area are Aberystwyth, Aberaeron and New Quay. In rural areas the land use is predominately farming, with sheep rearing in the more upland areas, mixed sheep, beef and dairy farming in the middle reaches and dairy and arable in the lower valleys and coastal strip. Forestry is a major land use in the upper Rheidol and Ystwyth catchments.

The Rheidol and Ystwyth rise in the Cambrian Mountains and descend through rocky valleys, tracts of coniferous forest and, in the case of the Rheidol, a series of mountain lakes and reservoirs, before meandering through the glacial gravels, deciduous woodland and low lying pasture of the floodplain to the sea. The Rheidol is a regulated, heavily modified river, as part of the Rheidol hydroelectric scheme, with a single major tributary, whereas the Ystwyth is flashy and has numerous small tributaries. The Aeron has its source at Llyn Eiddwen and flows for some 17km to the sea at Aberaeron. The Clarach has the typical features of an upland river with exposed boulders, rapids and waterfalls in the upper reaches while in the lower reaches the river is characterised by riffles and pools.

Summary data of the overall WFD condition of water bodies in this hydrometric area is not readily available because data are summarised in “Management Catchments summaries” and the Ystwyth hydrometric area is summarised with others in “The Teifi and North Ceredigion management Catchment”. The majority of rivers in the area are classed as moderate overall status in the 2015 WFD classification, with one classified as poor and only two as good.

The Rheidol, Ystwyth and Aeron also support salmon, sea trout and brown trout. There are also a number of thriving still water fisheries that have been developed for trout and coarse fish. Salmon and sea trout rod catches on the Aeron were variable, with highest recorded in 2012. In 2018 the sea trout stocks status were “probably at risk”, salmon rod catches were too low to assess the stock status.

Salmon rod catches on the Rheidol were highest in 2011, 2012 and 2013 and sea trout rod catches were highest in 2012 and lowest in 2017. In 2018 the salmon stock status was “at risk” and sea trout stock were “probably at risk”.

Salmon rod catches from the Ystwyth declined between 2010 and 2018, the sea trout rod catches were more variable. In 2018 the sea trout stocks status were “at risk”, salmon rod catches were too low to assess the stock status.

## Results

Sites were surveyed between July 2017 and April 2018 (in the months of July to September, with 4 sites in December and one in April 2018) and otter signs were found at 78% (Table 19). There was a **12% decline** in the number of sites where

## OTTER SURVEY OF WALES 2015-2018

otter signs were found since the last survey in 2009-10 and this decline was statistically significant (Table 2 in overall results section).

Table 19 Ystwyth results

	1977-78	1984	1991	2002	2009-10	2017-18
Positive sites (positive/total)	19/63	39/65	47/65	47/65	58/65	47/60
% positive	30%	60%	72%	72%	89%	78%

### Discussion

Most new negative sites were on the Yswyth and the Rheidol, in the 2002 survey (which had a similar percentage positive sites to the 2017-18 survey) it was these two rivers that had the most negative sites within this hydrometric area. In the 2009-10 survey they were only 7 negative sites that were spread throughout the area. In 2002 the negative sites were concentrated in the headwaters, however in 2010 and 2017-18 the Rheidol headwaters were positive.

## Verification of results

Evidence from Ireland indicates that river conditions, in particular rainfall prior to otter surveys, as well as variation in surveyor experience can unduly influence the likelihood of otter signs being found (Reid et al., 2013). In periods of high river flow, or spate, otter spraint and footprints can be washed away resulting in false negatives. As initial analysis of the sixth otter survey of Wales results indicated an unexpected decline, combined with the new approach of using somewhat less experienced volunteers for some sites, efforts were made to verify the results. Two forms of verification were undertaken;

1. Data analysis to assess the influence of river flow and surveyor experience on survey results.
2. Resurvey by an expert surveyor of the two hydrometric areas with the greatest decline (Teifi and Loughor).

## Did river conditions alter the likelihood of finding otter signs?

NRW hydrology teams matched each otter survey site to the nearest gauging station and extracted flow data at each site within the week and two weeks prior to each of the four otter surveys of Wales between 1991 and 2018. Mean flow ( $Q_{\text{mean}}$ ) was used as an approximate threshold for a Hydrologist Technical Officer to assess if a spate (a sudden flood) had occurred. At level only gauging stations, the size of the river was used to judge if a river level increase and decrease constituted a spate. Those classified by the hydrologist as very minor or minor spates were discounted, so that a binary variable (spate yes or no) was created. It was not possible to match every survey to spate data as some survey dates were missing. Spate data were collated for survey sites from the third ( $n=913$ ), fourth ( $n=881$ ), fifth ( $n=763$ ) and sixth ( $n=888$ ) national survey.

Statistical analysis using binomial Generalised Linear Models were attempted to test for variation in survey results associated with spate events and surveyor experience simultaneously but failed to meet model assumptions. Chi-squared tests were used to determine whether there was a significant association between spate events (in the week or two weeks prior to the survey) and otter survey result.

Otter signs were significantly more likely to be found where there had not been a spate in the previous week ( $\chi^2=34.99$ , d.f.=1,  $p<0.001$ , 72% of sites without spates and 62% of sites with spates had otter signs). In contrast there was no association between otter survey result and spates occurring within 2 weeks prior to the survey ( $\chi^2=0.36$ , d.f.=1,  $p=0.55$ , 70% of sites with spates and 69% of sites without spates had otter signs). **It is therefore reasonable to conclude that overall there is a negative impact of spate events occurring in the week (but not two weeks) prior to survey on the probability of finding otter signs.**

Overall, the percentage of survey sites with a spate event occurring within the week prior to survey did not vary significantly between the third (29%), fourth (35%), fifth

(33%) and sixth (33%) national otter surveys ( $\chi^2=7.19$ , d.f.=3 p=0.07). Within sites where spate events had occurred within the week or two weeks prior to the survey, the percentage of sites that were positive for otter signs followed similar patterns to the overall national survey results (Figure 5). **It is therefore reasonable to assume that river spates did not disproportionately impact the most recent (sixth) national survey.**

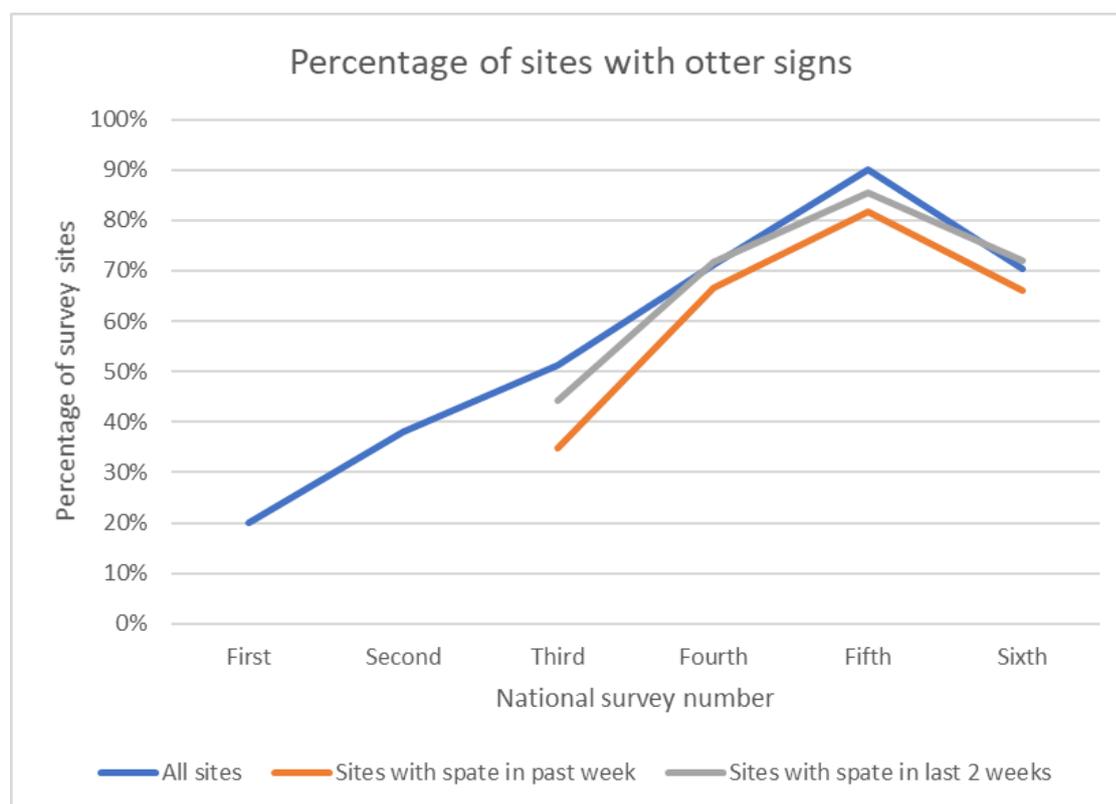


Figure 5 The percentage of survey sites in Wales that were positive for otter signs in six national otter surveys, and the percentage of sites where recent spate events had occurred.

## Did less experienced surveyors find fewer otter signs?

Surveyors were assigned as either experienced or not experienced based on personal knowledge of the surveyor by Eleanor Kean (Cardiff University) or Becky Clews-Roberts (NRW). Experienced surveyors were individuals who had conducted multiple otter surveys previously either in a professional or voluntary capacity. Statistical analysis using binomial Generalised Linear Models were attempted to test for variation in survey results associated with spate events and surveyor experience simultaneously but failed to meet model assumptions. Chi-squared tests were used to determine whether there was a significant association between surveyor experience and otter survey result.

## OTTER SURVEY OF WALES 2015-2018

In the sixth national survey (2015-2018), surveyor experience varied between hydrometric areas with between 25% and 100% of sites being visited by experienced surveyors. 729 sites (68%) were surveyed by experienced surveyors, 343 (32%) were surveyed by inexperienced surveyors (and for 36 survey sites either surveyor name was not recorded or sites were not surveyed/were inaccessible). Experienced surveyors found otter signs at 70% of the sites they surveyed, inexperienced surveyors found otter signs at 72% of sites, this small difference was not statistically significant ( $\chi^2=0.50$ , d.f.=1,  $p=0.48$ ). The presence or absence of otter signs was not associated with surveyor experience.

Misidentification of items as otter spraint by inexperienced surveyors (i.e. false positives) was thought to be low. Cardiff University Otter Project examined spraint collected as part of this survey across six catchments in south Wales and found only one surveyor had collected samples that were not otter spraint. All of those sites were resurveyed.

Two hydrometric areas, the Teifi and the Loughor, were resurveyed between December 2019-February 2020 by the highly experienced surveyor Andrew Crawford. Mr Crawford was the lead author of the first national survey in Wales in 1977-78. Mr Crawford found 74% and 57% of sites positive for otter signs on the Teifi and Loughor respectively, compared to the 50% and 63% found by volunteers in the 2015-17 surveys (Table 20). Although there are differences in the percentage positive sites between the volunteer surveys (2015-17) and Mr Crawford's surveys (2019-20), both represent a decrease in otter signs since 2009-10. As Mr Crawford's surveys were not done in the same year or the same time of year as those of the less experienced surveyors, it is not possible to rule out a genuine increase in otter signs on the Teifi between 2015-17 and 2019-20 or seasonal differences. In addition, Mr Crawford noted that in many cases it was necessary to survey considerable distances to find the first otter signs and even then only old spraint was found. **It is therefore reasonable to conclude that surveyor experience did not invalidate the results of the sixth national survey. However, the method of assessing volunteer experience was crude and future surveys should seek to rate and record volunteer experience in a more systematic way. Ideally, focused national surveys should seek to exclude inexperienced surveyors to avoid the risk of complicating the interpretation of results.**

Table 20 Percentage of sites where otter signs were found (positive sites) from two hydrometric areas resurveyed by a highly experienced otter surveyor

	2009-10	2015-18 (volunteers)	2019-20 (Andrew Crawford)
Teifi	96%	50% (July 2015-Sept 2017)	74% (Dec 2019-Feb 2020)
Loughor	100%	63% (Nov 2017-April 2018)	57% (Dec 2019-Feb 2020)

## Discussion

### Interpretation of results and national trends

A decline in otter signs has been recorded for the first time since otter surveys at a national level began in Wales in 1977. Prior to the survey reported here, the percentage of sites which contained signs of otters had been increasing with each survey. On a national level, otter signs have declined by 21.7% since the last survey in 2009-10, and this decline varied between hydrometric areas from 14% (Cleddau) to 48% (Teifi). Although some concerns surrounding the change in methodology were raised (the recruitment of less experienced volunteers in some cases, the longer time period over which the surveys were undertaken), resurvey of two catchments (Teifi and Loughor) and analyses of spate data and surveyor experience suggest the original survey results should be considered as valid. It would be negligent to assume otherwise. The results of many hydrometric areas (Cleddau, Clwyd, Conwy, Dee, Loughor, Taff, Tywi and Usk) are now at pre-2002 levels. The Teifi and Wye are at pre-1991 levels. There is, therefore, cause for some concern about the ongoing conservation status of otters in Wales. Particular areas of concern are those hydrometric areas where otter signs declined by more than 20% and the decline was statistically significant; Teifi, Conwy, Loughor, Glaslyn, Mid-Glamorgan, Usk, Wye and Tywi.

The declines are not universal: the change between the latest and the previous survey was not statistically significant in the Severn, Dyfi, Dee, Ystwyth, Taff, Clwyd and Anglesey. For the Taff, Clwyd and Anglesey areas, the small number of sampling sites may contribute to this lack of statistical significance, so these declines should not be ignored. Interestingly the area with the largest decline, the Teifi, was the only catchment to have a decline (albeit very small) between the 2002 and 2009-10 surveys (see table in Appendix 1), suggesting that even small declines may indicate the start of a larger decline.

The number of otter signs cannot be directly related to the number of otters. It is not known if a site with multiple spraints has one otter that marks frequently or several otters each marking that site just once. Despite this uncertainty, a 22% decline in sites with signs of otters suggests there has been at least some real decline in otter numbers. National survey methodology is intended as a snapshot to give a broad indication of otter distribution over a large geographical scale. Otters live at low densities and have large-ranges, therefore further work is necessary, using repeat surveys as suggested by Reid et al. (2013) and Parry et al. (2013), to confirm occupancy or absence on a site-specific basis.

Otters found dead are regularly recorded, and since the early 1990's otter carcasses have been collected for post-mortem examination. Unfortunately these data are not sufficient to assess the scale of a decline in the Welsh otter population. Between 1978 and 2009 a positive linear relationship between the number of otter road deaths and national survey results was found in Wales (Strachan, 2015), although this relationship was not tested statistically. Examination of the data held by Cardiff University Otter Project suggests this may still be the case (Figure 6), however since

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2007 the number of otters recovered for post-mortem examination fluctuates widely (between 31 and 68 per year). It is difficult to separate the impacts of a potential decline in otter population size from those of the now more ad-hoc recovery of carcasses (since the termination of project management funding in 2010).

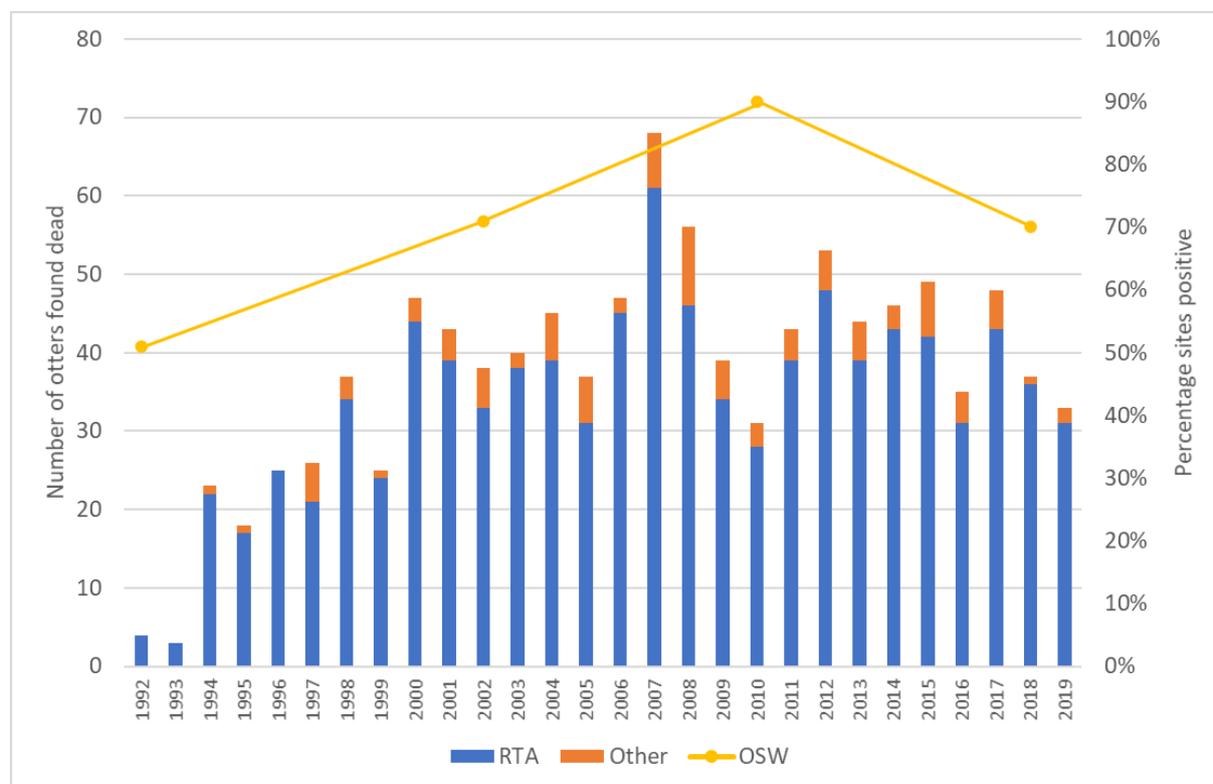


Figure 6 Number of otters found dead in Wales and sent for post-mortem examination in relation to Otter Survey of Wales results.

Cause of death is split RTA=road traffic accident, Other=all other causes of death e.g. disease or starvation. Note: It is usual for there to be a delay between otter death and full post-mortem examination, due to the regional collection of carcasses before transport of a batch to Cardiff. The number of otters in 2018-19 may in part reflect this.

In the sixth OSW we found some clusters of newly negative sites, for example on the Afon Mawddach in the Dyfi area, however, in most areas the newly negative sites are neither focused on particular rivers nor either coastal or headwaters. This lack of spatial pattern points towards a widespread rather than localised cause for declines in otter signs. However, on some catchments such as the Teifi, localised events may be an important factor. Below we discuss potential causes for the declines, and it is likely that more than one of these explains the results. The previous otter survey of Wales (Strachan, 2015) included an extensive discussion of threats to otters. We have not sought to replicate that here, but to provide updates since then.

## Patterns of wildlife population recovery

Previously, in the fifth survey of Wales (Strachan, 2015) and the fifth survey of England (Crawford 2010) full carrying capacity was assumed to be 80% positive sites for two consecutive surveys, although there appears to be little basis for this figure. Using this criteria, only the Cleddau, Dee and Severn are at carrying capacity. Carrying capacity is not however fixed and varies depending on the resources available. In practice, carrying capacity is challenging to quantify so this measure is likely too simplistic. Concerns have been raised by members of the angling community across the UK that otter population recovery exceeded that of the resources available, leading to depletion in fish. There is little evidence for this here; since otter surveys of Wales began in 1977 only 6 hydrometric areas have reached 90% positive sites and sustained this over two survey periods (Appendix 1). With the exception of the Severn hydrometric area, all areas that had reached 90% by 2009-10 dropped below 90% in 2015-18, suggesting something changed in their environment during that time period, rather than there being a consistent pattern to otter population recovery. We suggest that other pressures on otter food supply have a greater impact e.g. migration barriers, pollution, climate change. However, further consideration should be given to the published literature on wildlife population recovery and patterns of otter population recovery e.g. molecular research.

## Prey availability

Salmonids are nutrient and fat rich prey for otters and their presence in otter diets is associated with greater otter body condition (Moorhouse-Gann, 2020). All salmon stocks in Wales are currently assessed as 'At Risk' or 'Probably at Risk' of failing to achieve management targets (NRW Salmon stock performance in Wales, 2019) and nationally and internationally salmon stocks are considered to be at the lowest level ever. Eighty-eight percent of sea trout rivers are assessed as 'At Risk' or 'Probably at Risk' of failing to achieve management targets (NRW Sea trout stock performance in Wales, 2019). There is uncertainty as to why these fish are declining, but climate change has been implicated as a factor affecting salmonids at sea. Fish data held by NRW could be interrogated to evaluate if there is a spatial relationship between localised declines in salmonids and otter signs. However, the otter results and salmonid stock status of the Clwyd and Conwy neighbouring catchments, suggest the relationship between salmonids and otters are unlikely to be simplistic.

Eels are also nutrient and fat rich prey and their presence in otter diets is associated with greater otter body condition (Moorhouse-Gann, 2020). European eel (*Anguilla anguilla*) population declines have been catastrophic with over 95% decrease in glass eel recruitment in Europe in recent decades (Westerberg et al., 2018). Between 1994 and 2010 eels declined in otter diet across Wales and England (Moorhouse-Gann, 2020), therefore these declines in eels were happening at a time when otter populations were increasing. However, combined eel and salmonid declines might impact otter populations to a greater extent. No otter diet research based on otters in Wales has been published in the last 10 years so it is unclear if salmonids have declined or eels have declined further in otter diet, however Cardiff University should publish results in this area soon.

Otters are generalist predators, taking a wide range of fish species, mammals, birds, amphibians and invertebrates. This trait is likely to have assisted their previous population recovery. The variety of prey items taken by otters is well described from spraint analysis, post-mortem gut content analysis or direct observation of otters feeding. Unlike salmonids, little information exists on the status and therefore availability of other prey taken by otters. Cardiff University Otter Project (CUOP) have identified small fish species such as bullhead and stickleback increasing in otter stomachs across Wales and England over time, and that these smaller prey do not have the equivalent nutritional value to that of eels or salmonids (Moorhouse-Gann, 2020). There was also an increase in the number of otters arriving for post-mortem examination with empty stomachs. The research team identified amphibians as being particularly important prey for otters in Wales when compared to the Midlands, Anglia and south of England, and that the consumption of amphibians was associated with poor body condition. It was not possible to assess whether poor body condition led otters to consume more amphibians rather than competing for higher quality prey, or if amphibian consumption led to poor body condition. Further research is needed to understand the implications of these diet shifts on otter populations.

### **Water quality, Water Framework Directive status and otters.**

Water quality issues such as acidification, eutrophication and sedimentation could impact otters by reducing their food sources through changes in fish communities and overall biomass and productivity. The Water Framework Directive (WFD) provides the criteria for monitoring rivers, lakes, estuaries, coastal waters and groundwaters with the aim of maintaining or improving water quality, both ecological and chemical.

In Wales, overall water body classification improved between 2009 and 2015 from 32% to 39% classed as good or better. Between 2009 and 2015, WFD classification results showed that 3% of the surface water bodies deteriorated based on ecological status and 0.05% deteriorated based on chemical status, however, 79% of waterbodies were not assessed for chemical status (River Basin Planning Progress Report for Wales 2009-2015 NRW, 2015). Summary reporting on 2018 Cycle 2 Overall Interim Classification for surface waters indicates little change between 2015 and 2018. As there hasn't been a widespread decline in WFD status, it seems unlikely that it is linked to the declines in otter signs recorded in the same time period.

In addition to WFD reporting, between 2017 and 2019 NRW assessed compliance against phosphorous targets in the nine Special Areas of Conservation (SACs) in Wales designated for river features (Hatton-Ellis and Jones, 2021). Overall, 61% of assessed SAC water bodies failed their targets and NRW recognises the significant problem of phosphorous pollution, particularly in the Teifi, Cleddau, Usk and Wye. On first glance there doesn't appear to be a direct association between phosphorous target results and otter decline (e.g. no phosphorus target failures in the Tywi, where there was a 22% decline in otter signs), but the negative impact of nutrient pollution

on river ecology cannot be ruled out as a potential contributing factor. Further water quality compliance assessments for the SAC rivers are due to be published by NRW shortly.

Every year hundreds of pollution incidents occur from various sectors, the water industry and agriculture being the most frequent polluters (Foster, Hatton-Ellis and Hearn, 2021), but there isn't reliable source apportionment for diffuse pollution (NRW, 2021). Pollution incidents can result in fish kills. Whilst otters are generalist predators, capable of eating alternative prey e.g. birds and small mammals, it is not clear for what period of time an otter could sustain itself on a non-fish diet. Repeated pollution incidents, or single incidents resulting in large numbers of fish deaths could impact otters. It can take many years for a fish population to recover following a significant fish kill incident. For a species with a low reproduction rate such as the otter (females have 1-3 cubs that stay with her for 12-18 months) it is possible these localised events could limit local otter populations.

### Contaminants in otters

Past declines in otter populations have been linked to persistent organic pollutants (POPs), such as dieldrin, DDT and PCBs and it is unclear whether otter recovery is hampered in any areas of the UK by the persistence of these compounds. Otter liver concentrations that exceed published thresholds indicative of toxicity or reproductive impacts were recorded by Cardiff University Otter Project (CUOP) as recently as 2009 (Kean et al., 2021). However, as Wales reached 90% sites occupied in the 2009-10 national survey, and POPs use is banned under the Stockholm Convention (2001), it is unlikely that POPs are responsible for the decline recorded in the 2015-18 survey. Funding for regular analysis of otter liver samples from across Wales ceased in 2009. Cardiff University has retained samples since then and NRW have committed to a one-off funding of a limited selection of 100 otters to analyse time trends in concentrations of PCBs, OCs, metals and PBDEs.

Per- and polyfluoroalkyl substances (PFAS) which are persistent, bioaccumulate and can be toxic were recorded in 100% of a small sample of otters from Wales (n=8) that were screened as part of a one-off screening in 2007-8 (O'Rourke et al., 2020). At the date of writing, funding is not available to screen more otters for PFASs in Wales. Environment Agency and CUOP are working together to screen some otters from England. New priority substances, including PFASs were added to the 2019 WFD assessment in England resulting in no rivers assessed as having good chemical status. Water bodies in Wales have not been assessed yet using these new criteria.

More recently (2006-2017) metal concentrations in otter livers have been quantified, including samples from Wales, and were found to be below levels likely to be associated with adverse effects (Brand et al., 2020). The results suggest that larger-scale geochemical and hydrological processes are important in determining metal exposure in otters, more so than point source inputs. Despite increases in use of nanosilver no increase in silver concentrations in otters were recorded. Liver chromium and nickel concentrations declined significantly over time, but other metals showed no temporal change.

To identify new current use chemical pollutants (those not banned), such as pesticides and pharmaceuticals, otter samples from the UK, including some from Wales, have been submitted for broad-spectrum screening by the LifeApex project (<https://lifeapex.eu/> funded to September 2022). Cardiff University has also undertaken research on the presence of microplastics in otter stomachs, but the results were not completed at the time of the publication of this report.

Otters are exposed to a variety of pollutants, and although based on available evidence none alone currently seem to restrict populations, the combined impacts of exposure to multiple contaminants simultaneously are not clear. It is important to note the lack of information on otter exposure to some priority substances and any health implications of those.

### Road Traffic Mortality

Deaths of otters caused by road traffic collisions have long thought to be a concern for otters in Wales. Much work has been done in the past, including by Cardiff University Otter Project and the Roads and Otters Steering Group to identify black spots (sites of multiple mortalities) and implement mitigation. Otter road mortality data have not been interrogated for black spots since 2012 and the Roads and Otters Steering Group no longer meet. Significant but unquantified resources are put into underpasses, ledges and otter-proof fencing for new road schemes, bridge replacements and road widening schemes, however, there is rarely follow-up monitoring of their effectiveness.

Road traffic casualties have not previously prevented the recovery of otters across the UK, which would suggest road traffic is unlikely to be a cause for decline now, although it is a pressure that could have increased with increased traffic volume. High rainfall and spate conditions are linked to otter deaths on roads (Grogan et. al., 2001), raising the possibility that deaths will be more likely as spate conditions become more frequent with climate change.



Otter using underpass in Carmarthenshire in 2018 © Rhodri Phillipps

## Evidence of otter reproduction

Since 1992 Cardiff University Otter project has been conducting post-mortem examinations on otter carcasses collected across Wales and England. Between 1992 and 2018, it was possible to assess the reproductive status of 194 female otters found dead across Wales. This is the only currently applied measure of otter reproduction. The sample size each year was small and variable (n=1-13) so years were grouped into pairs for the purposes of Figure 7. Signs of reproduction were either confirmed pregnancy or lactation. The proportion of female otters with signs of recent reproduction has declined since the 2009-10 otter survey of Wales, however prior to that there doesn't appear to be a correlation between national survey result and proportion of females showing signs of recent reproduction. More detailed measures of otter reproduction are needed.

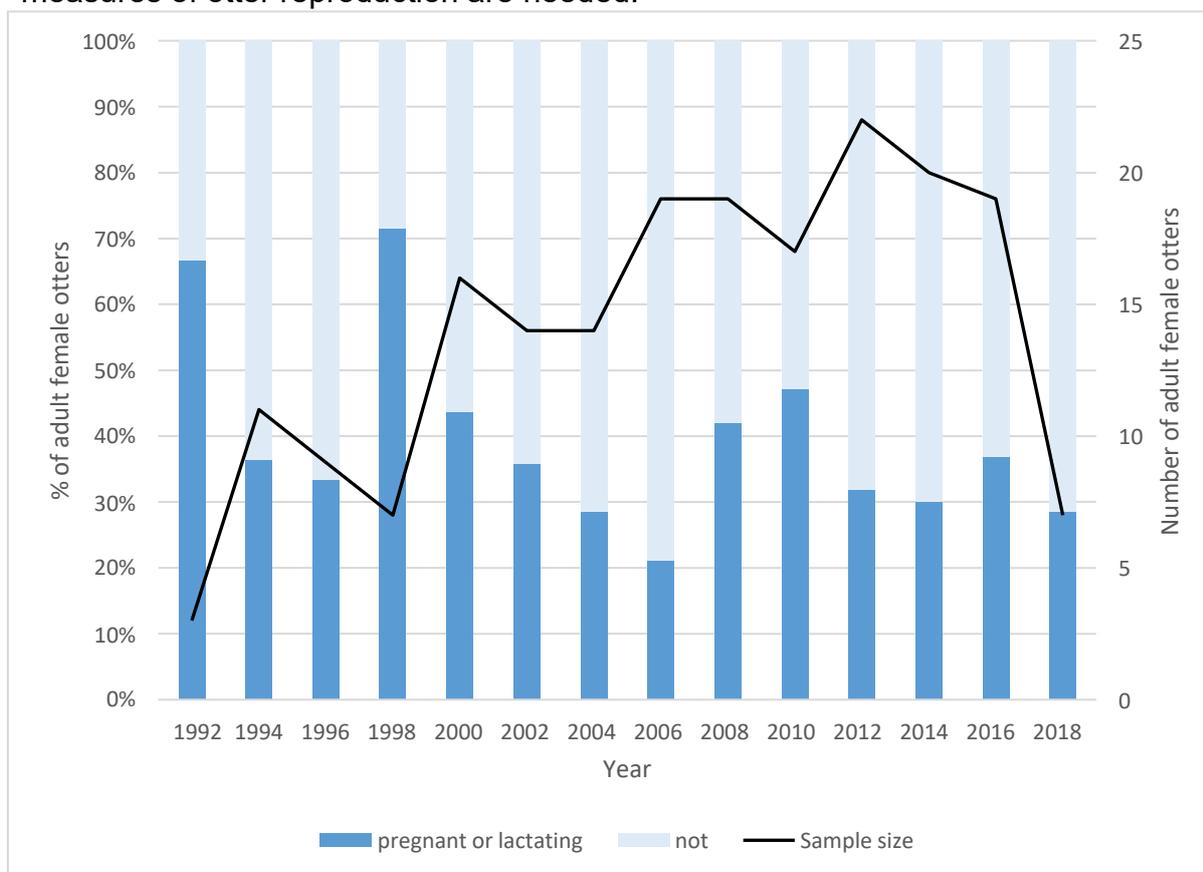


Figure 7 The proportion of dead adult female otters that were examined and showed signs of recent reproduction (i.e. were pregnant or lactating at time of death) in Wales.

Note: It is usual for there to be a delay between otter death and full post-mortem examination, due to the regional collection of carcasses before transport of a batch to Cardiff. The low number of adult females in 2018-19 may in part reflect this.

## Disturbance and conflict with humans

- Drownings

Concern was raised in the last Otter Survey of Wales that incidental drowning of coastal otters could be an under recorded cause of otter mortality (Strachan, 2015). In Wales, no further incidents of drowning in lobster creels or crab pots have been recorded since 2015 (E. Chadwick, pers com.), however this could be a consequence of non-reporting and in some local areas it could still be an issue.

- Disturbance and availability of breeding sites

Female otters require undisturbed areas for rearing young, known as breeding sites. Extensive grazing, removal of scrub or development that reduces vegetation in the riparian zone will all reduce the availability of suitable breeding sites. For example, of 11 breeding sites assessed in 2012 only 5 were still potential breeding sites (Liles, 2012). Furthermore extensive cattle grazed pasture in the riparian zone has been identified as a factor influencing condition assessment in RHS for the Teifi SAC, and fencing of the riparian zone to allow natural regeneration is proposed as a solution (Baxter et al., 2017). Development and increased recreation on and next to water features could also lead to increased disturbance resulting in a site no longer being suitable as an otter breeding site e.g. installation of riverside path for dog walkers at a caravan park. There is no wider assessment of the availability of otter breeding sites across Wales. Although there are other localised reports of the availability of otter breeding sites, they are geographically limited and these have not been collated. If repeat surveys are available, for example as part of SAC monitoring, they may provide some indication as to whether they have decreased in availability during the same time period that otter signs have decreased (i.e. 2009-2018).

- Urban otters

Reports of otters in towns and cities have continued. The expansion of otter distribution into urban areas appears consistent with natural expansion on whole catchments, rather than movement away from rural areas. It is still unclear whether the breeding success and condition of otters in these more urban areas is compromised, as is sometimes suggested because of the presumption that the habitat is less favourable. This could, at least in part, be investigated using post-mortem records. These otters may be at greater risk of road traffic accident, for example, the first recorded otter death on a road in Cardiff City Centre was recorded in 2019.

- Otter predation and persecution

There continue to be reports of otters preying on garden fish ponds and still-water fishery predation is likely to be commonplace where these features occur and are unprotected. Questions have been raised as to whether these are otters derived from captivity or whether this is an indication of there being “too many otters” resulting in the exploitation of less traditional resources. However, such predation is a natural consequence of a recovering otter population, and of individual otters exploring their home range, utilising available habitats and prey resources. Some local illegal persecution may have occurred as a result of such predation, but there is

no evidence that this could have been of a scale to explain the declines observed. Current advice remains to erect otter proof fencing to protect still waters wherever possible and desirable to protect valuable fish. Persecution may also occur because of perceived impacts on river fisheries, but there is no evidence for this.

There has been no systematic recording of either urban otter records, predation on still water fisheries or persecution so it is not possible to assess if these have increased or decreased during the period between the fifth (2009-10) and sixth (2015-18) national otter survey in Wales.

## Conclusion

- Otter signs were found at 70% of survey sites in the 2015-18 otter survey of Wales.
- Sites with signs of otters have declined by 22% since the last survey in 2009-10.
- This is the first decline recorded since national surveys began in the 1970s.
- It is difficult to ascribe a cause for this decline, although small changes in methodology is unlikely to be the explanation.
- Persistent pollutants and road traffic casualties are no longer thought to restrict populations, although information on some of the newer priority substances is still lacking.
- Otter diet appears to have changed based on the evidence available (this would benefit from updating with data from 2010 to 2020) and a decline in some prey species, largely reflecting more widespread trends in the status of some key migratory fish, may be restricting some local otter populations.
- Further monitoring of the status of the otter population in Wales is necessary to see if this current reversal in population trend continues and research is needed to investigate the causes for the decline recorded here. Pressures that impact prey populations are relevant to otter populations, and so impacts such as river pollution, need to be considered.

## Recommendations

### Site protection

- Habitat management plans should be drawn up that incorporate measures to:
  - Protect existing breeding sites, both actual and potential.
  - Create or enhance new sites for otter breeding, as necessary.
  - Protect or create feeding sites associated with breeding sites, as necessary.
- Work towards meeting water quality objectives on all rivers across Wales so they can support healthy fish stocks.
- Facilitate range expansion across priority habitats through partnership with other stakeholders

## Species protection

The following are recommended to ensure adequate species protection in Wales

- Continuation of protected status is essential. As a European Protected Species, otters must be considered in the Local Authority planning process and flood defence management programmes as well as large scale operations such as forestry felling and tree harvesting.
- Otter Road Mortality data should continue to be collected with retrieved corpses sent for post-mortem and tissue analysis (ecotoxicology studies). Otter road mortality hotspots should then be investigated, and effective mitigation measures implemented.
- Other anthropogenic mortality factors should also be documented and assessed where concern is raised, such as illegal persecution or the accidental drowning of otters in lobster or crab pots, fish nets or eel fyke-nets.

## Disseminate report results and conservation advice

- The results in this report should be widely shared with other stakeholders so that consideration for otters can be incorporated into their work. This has already begun with the formation of the Otter Survey Wales review and discussion group including representatives from England and Scotland statutory bodies and The Mammal Society.
- Promote riparian and wetland management advice (e.g. via farm advisors) that includes measures that are favourable to otters.
- Conflict with the stillwater angling community should be assessed and where otters have been shown to create a genuine problem for the fishery, practical solutions such as otter proof fencing should be put in place.
- Promote advice about preventing anthropogenic otter mortalities, including priority otter road mortality sites, for subsequent remedial action.

## Future surveys

- Repeat a national survey within 5 years. Improve reporting to include electronic submission of survey data to speed up analyses and reporting. More funding will be needed to enable this. Consider re-syncing England and Wales otter surveys so that examination of boarder areas (Dee, Severn, Wye) are more meaningful.
- It will be necessary to identify new survey sites to replace those that were found to be inaccessible in the most recent survey.
- Consider the establishment of a volunteer-based surveillance methodology to provide more frequent assessments of otter status in Wales. This may be possible through the use of existing recording apps e.g. The Mammal Society Mammal Mapper app, however resources will still be needed for volunteer recruitment and training; data analysis and interpretation. Many local enthusiasts record otter signs and photograph otters, with some coordination these could be very useful sources of information. Examine local record

centre otter records (excluding OSW records) to investigate if there is sufficient volume to be useful in assessing otter population status.

- Consider changing reporting to fit in with spatial areas used in other NRW reporting e.g. management catchments, this would make comparisons with other water data easier e.g. fish or WFD data.
- Include an assessment of habitat quality, in particular the availability of breeding sites and the extent of disturbance. Repeat of SAC river monitoring for otters and extend to other waterways in Wales. This requires more specialised skill than searching for otter spraint and so requires suitably qualified/experienced personnel.
- Reliable estimates of otter densities are lacking. Population size estimates have relied on a single study of released otters in East Anglia (Jefferies *et al.* 1986). Genetic analysis of spraint is particularly difficult (Lerone *et al.* 2014, Murphy *et al.* 2003), with low success rates meaning (Dallas *et al.* 2003, White *et al.* 2013) analysis of samples from across Wales would be prohibitively expensive. Methodological improvements using next generation sequencing are currently being investigated by Cardiff University. Targeted genetic studies to investigate otter densities in smaller areas of different riparian and coastal habitats, could be used to produce more robust estimates of population size across Wales.

### Evidence gaps and research

- Investigate potential causes for the decline in otter signs, including associations with ecological status of rivers, availability of breeding sites across different habitats, disturbance, water quality, pollution incidents, salmonid and eel declines and wider prey availability.
- Investigate the health and breeding success of otters in urban areas.
- Monitoring of the effectiveness of road mitigation measures. The lack of a national database of mitigation measures hinders research into their effectiveness and assessment of population level impacts.
- Support otter diet research to update that conducted to 2010 and investigate associations with prey availability. We know from the CUOP data (Moorhouse-Gann, 2020) that otters eating eels and salmonids is associated with better body condition, but does that impact breeding?
- Maintain an otter health surveillance system through a programme of post-mortem work. Support the assessment of the occurrence in otter tissues of priority substances of the WFD and Environmental Quality Standards Directive (EQSD).

## References

- Andrews E & Crawford A. 1986. Otter Survey of Wales 1984-85. The Vincent Wildlife Trust, London.
- Andrews, Howell & Johnson. 1993. Otter Survey of Wales 1991. The Vincent Wildlife Trust, London.
- Baxter E, McKenzie S, Jones D, Jones C and Metcalfe P. 2017. Condition Assessment using 2016 River Habitat Survey data and Common Standards Monitoring guidance for the Afon Teifi and Afon Eden – Cors Goch Trawsfynydd SACs. Ecus Ltd in association with TerraAqua Ecological Services Ltd. NRW Evidence Report No. 192.
- Brand, A-F, Hynes J, Walker LA, Pereira M, Gloria L, Alan J, Williams RJ, Shore RF and Chadwick EA. 2020. Biological and anthropogenic predictors of metal concentration in the Eurasian otter, a sentinel of freshwater ecosystems. *Environmental Pollution* 266 (Part 3), 115280. 10.1016/j.envpol.2020.115280
- CEFAS, EA and NRW. 2020. Salmon stocks and fisheries in England and Wales, 2019. Preliminary assessment prepared for ICES, March 2020. CEFAS, Lowestoft.
- Chanin, P. 2003. Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.
- Crawford A. 2010. Otter Survey of England 2009. Environment Agency, Bristol.
- Crawford A, Evans D, Jones A & McNulty J. 1979. Otter Survey of Wales 1977-78. Society for the Promotion of Nature Conservation, Nettleham.
- Dallas JF, Coxon KE, Sykes T, Chanin PRF, Marshall F, Carss DN, Bacon PJ, Piertney SB, Racey PA. 2003. Similar estimates of population genetic composition and sex ratio derived from carcasses and faeces of Eurasian otter *Lutra lutra*. *Mol Ecol*. 12:275–282.
- Foster H, Hatton-Ellis T and Hearn S. 2021. SoNaRR2020 Assessment of the achievement of sustainable management of natural resources: Freshwater. Natural Resources Wales
- Grogan A, Philcox C, and Macdonald DW. 2001. Nature Conservation and Roads: Advice in relation to otters. WildCRU/Highways Agency, London.
- Hatton-Ellis TW, Jones TG. 2021. Compliance Assessment of Welsh River SACs against Phosphorus Targets. NRW Evidence Report No: 489, 96pp, Natural Resources Wales, Bangor
- Jefferies DJ, Wayre P, Jessop RM, and Mitchell-Jones, A.J. 1986. Reinforcing the native otter *Lutra lutra* population in East Anglia: an analysis of the behaviour and range development of the first release group. *Mammal Review*, 16: 65-79.

## OTTER SURVEY OF WALES 2015-2018

Jones T and Jones D 2004. Otter Survey of Wales 2002. Environment Agency Wales, Cardiff.

Kean EF, Shore RF, Scholey G, Strachan R, and Chadwick EA. 2021. Persistent pollutants exceed toxic thresholds in a freshwater top predator decades after legislative control. *Environmental Pollution*. 272, 116415

Lerone L, Mengoni C, Carpaneto GM, Randi E, and Loy A. 2014. Procedures to genotype problematic non-invasive otter (*Lutra lutra*) samples. *Acta theriologica*, 59(4), pp.511-520.

Liles G. 2006. Site Condition Monitoring of Special Areas of Conservation: Otters. Unpublished report to CCW.

Liles G. 2012. Afon Teifi: potential breeding sites. Unpublished report to CCW.

Moorhouse-Gann RJ, Kean EF, Parry G, Valladares S, and Chadwick EA. 2020. Dietary complexity and hidden costs of prey switching in a generalist top predator. *Ecology and Evolution* 10 (13), pp. 6395-6408. 10.1002/ece3.6375

NRW. 2021. SoNaRR2020: Evidence needs. Available from <https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/evidence-needs-table/?lang=en>

O'Rourke E, Hynes J, Losada S, Barber J and Chadwick EA. 2020. Concentrations of per- and polyfluoroalkyl substances (PFAS) in Eurasian otters (*Lutra lutra*) from Wales and England. Report for Natural Resources Wales, produced by Cardiff University Otter Project, at Cardiff University School of Biosciences.

Parry GS, Bodger O, McDonald RA, and Forman DW. 2013. A systematic re-sampling approach to assess the probability of detecting otters *Lutra lutra* using spraint surveys on small lowland rivers. *Ecological Informatics*, 14, 64-70

Reid N, Lundy MG, Hayden B, Lynn D, Marnell F, McDonald RA, and Montgomery WI. 2013. Detecting detectability: identifying and correcting bias in binary wildlife surveys demonstrates their potential impact on conservation assessments. *European Journal of Wildlife Research*, 59, 869–879

Strachan R. 2015. Otter Survey of Wales 2009-10. Natural Resources Wales, Cardiff

Westerberg H, Miller MJ, Wysujack K, Marohn L, Freese M, Pohlmann J-D, Hanel R. 2018. Larval abundance across the European eel spawning area: An analysis of recent and historic data. *Fish and Fisheries*, 19, 890–902. <https://doi.org/10.1111/faf.12298>.

White S, O'Neill D, O'Meara DB, Shores C, O'Reilly C, Harrington AP, Weyman G, and Sleeman DP. 2013. A Non-Invasive Genetic Survey Of Otters (*Lutra lutra*) In An Urban Environment: A Pilot Study With Citizen Scientists. *IUCN Otter Spec. Group Bull.* 30 (2): 103 – 111

**Hydrometric area descriptions were based on the following documents:**

- Dee River Basin Management Plan Summary 2015
- Severn River Basin Management Plan Environment Agency, 2016
- River Basin Planning Progress Report for Wales 2009-2015
- NRW Know Your Rivers reports
- NRW Salmon and sea trout catch controls 2017 consultation Annex 3 Rod and net catches; and juvenile salmon and trout data, and an addendum to that.
- The Salmon stock performance in Wales 2018
- The Sea trout stock performance in Wales 2018

## Appendix 1: Comparison of surveys

Change over time in percentage of sites with otter signs in each hydrometric area of Wales. Results greater than 80% are highlighted to illustrate recent change.

	1st 1977- 78	2nd 1984- 85	3rd 1991	4th 2002	5th 2009- 10	6th 2015- 18
Anglesey	18%	0%	0%	18%	69%	53%
Cleddau	41%	54%	71%	97%	97%	84%
Clwyd	4%	33%	63%	96%	96%	78%
Conwy	3%	19%	35%	90%	96%	57%
Dee	30%	40%	49%	87%	94%	85%
Dyfi	10%	32%	52%	58%	78%	71%
Glaslyn	18%	18%	17%	39%	94%	62%
Loughor	0%	0%	47%	81%	100%	63%
Mid-Glam	2%	0%	2%	21%	72%	51%
Severn	40%	67%	67%	86%	94%	93%
Taff	0%	5%	29%	76%	80%	67%
Teifi	38%	40%	59%	97%	96%	50%
Tywi	14%	67%	69%	77%	95%	73%
Usk	11%	25%	50%	82%	90%	66%
Wye	24%	62%	83%	94%	97%	73%
Ystwyth	30%	60%	73%	73%	90%	78%
<b>OVERALL</b>	<b>20%</b>	<b>38%</b>	<b>53%</b>	<b>74%</b>	<b>90%</b>	<b>70%</b>