Otter Survey of Wales 2009-10

Arolwg Dyfrgwn yng Nghymru 2009-10

Cyfoeth Naturiol Cymru
Natural Resources Wales

Grŵp Mamaliaid Eryri
Snowdonia Mammal Group

Otter Survey of Wales 2009-10

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Cover photo.
Otter cub self portrait using a trail-master camera trap (A. Harrington)

Foreword

This report on the Otter Survey of Wales 2009-10 is dedicated to the memory of Rob Strachan, the co-ordinator and project manager for the Survey on behalf of the Environment Agency Wales (EAW), and outstanding field naturalist and mammal specialist. Rob tragically died in May 2014 after a short illness with cancer, and didn't live to see this final report produced – I am very grateful to his close colleagues in Natural Resources Wales (successor to EAW) for pulling the threads of the survey results and draft report together and ensuring that the fruits of this endeavour are presented in this valuable and excellent report.

Rob's career was very much one of applying science to the practice and art of conservation, and of sharing his wealth of knowledge and expertise with others. Rob led or partnered on a number of national mammal surveys for otters, water voles and pine marten over a period spanning three decades. He was a key player in identifying and highlighting the decline of water voles at a national level, and in developing an understanding of the causes of their decline and the measures to address them, not least through his many years with the team of researchers at Oxford University's Wildlife Conservation Research Unit. Rob was a seasoned trainer in field identification of mammal signs, and his boundless knowledge was matched by his boundless energy, enthusiasm and generosity.

It was otters that first brought Rob and I together 25 years ago, and otters were always close to his heart. When he offered to manage and co-ordinate the fifth national otter survey of Wales I knew it was in very safe hands; this was borne out by the fact that thorough coverage was achieved with scant resources by the use of a network of well-organised expert volunteer surveyors. His loss to the world of mammal conservation in the UK is enormous, and he is sorely missed by all those fortunate to have known him well and worked with him.

Graham Scholey,
Environment Agency,
Chair – UK Otter Biodiversity Action Plan Steering Group.

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 mid1970s 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.

Monitoring otters

The first otter survey of Wales was carried out in 1977-78 covering 1018 sites across all the river catchments. Together with surveys in England, Scotland and Ireland, it provided a baseline for the distribution of otters in the British Isles. The baseline survey undertaken during 1977-78 found signs at 208 sites from a total of 1018 giving a percentage positive of 20%. This confirmed the results of the analysis of hunting records and the impression of many naturalists, that otters were absent or only sparsely distributed in much of the Country. Subsequent surveys and research have demonstrated that this was probably the low point of the decline which began in the late 1950s, and was primarily caused by the introduction of the persistent organochlorine pesticides dieldrin and aldrin that were widely used as seed dressing and sheep dip.

Trends

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.

Further sites were added to the 1018 baseline sites for the 1984-85 survey giving a total of 1097, of which 421 showed the presence of otters giving a percentage positive of 38%. In the 1991 survey an additional 5 sites were added giving a total of 1102, 579 of these showed the presence of otters, a percentage of 53%. During the 1984-85 and 1991 surveys additional Spot Check sites were included to provide additional sites to give a better picture of distribution. For the 2002 survey it was decided to concentrate efforts on full survey sites only, giving a total to survey of 1097 sites of which 784 showed the presence of otters, a percentage of 72%.

The 2009-10 survey incorporated the spot checks of the 1991 survey as full survey sites to bring the total sites to be surveyed as 1108

2009-10 Survey

During the period of July 2009 to March 2010 the fifth otter survey of Wales was undertaken by experienced expert volunteer surveyors drawn from across Wales including Environment Agency Wales (EAW) Biodiversity Staff, Wildlife Trust Staff, lBAP officers, local mammal groups and local naturalists

co-ordinated by Rob Strachan (EAW) in association with The Snowdonia Mammal Group.
Most of the sites were surveyed via a series of survey weekends and catchment targeted survey days around Wales. Expert volunteer assistance has been used for some catchments.
In addition to expert and experienced volunteers there was an opportunity to provide training for inexperienced volunteers by double manning at survey sites during the targeted catchment survey weekends.

Results
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 996 sites out of a national total of 1108 giving the percentage of positive sites as **89.89%.**
The results of this fifth national survey show a continued trend of recovery for the otter with some individual catchments attaining full capacity for the species. Out of 1108 sites surveyed across Wales only 112 were negative for otters at the time of survey

Four catchments were of particular concern in 2002, Anglesey, Mid Glamorgan, Taff and Glaslyn/Lleyn and these now have shown an impressive expansion in sites occupied by otters.

Geographical patterns
In North Wales the otter has continued to consolidate its range and is now widespread in the Hydrometric areas of Glaslyn/Lleyn, Conwy/Clwyd and Dee. The Dyfi has also shown an improvement but the rate is slower than in the adjacent areas. The most impressive expansion however has been on Anglesey with an impressive leap from 18% positive in 2002 to 67.5% positive in 2009 with new sites to the west and north of the island.

West Wales showed high percentage occupation of the sites sampled in the Cleddau, Teifi, Tywi and Loughor and it is likely that these catchments have reached close to carrying capacity.
The Ystwyth hydrometric area had also shown an improvement but like the Dyfi the rate of new sites is slower than adjacent areas.

The upper Severn catchment and upper Wye catchment showed a high level of site occupancy with both areas approaching carrying capacity for otters.

In South-east Wales the Usk, Taff and Mid Glamorgan rivers all showed impressive improvement since the 2002 survey. In particular, Mid Glamorgan showed an impressive leap from 18% positive in 2002 to 70% positive in 2010.
Otters can now be found using many of the rivers of the valleys even where disturbed by human activity. On the River Taff and River Ely, otters can now be found in the middle of Cardiff

An increase in otter distribution cannot be directly translated into an increase in otter numbers but such an increase in distribution must represent a significant increase in the number of otters on the rivers and wetlands of Wales. The tolerance of otters to apparently high disturbance situations such as city centres is far higher than was thought. They appear to select low disturbance habitats where possible but at least some otters are willing to tolerate high levels of human disturbance under some circumstances. It is likely that there is a variation between individual otters in the tolerance of human disturbance.

Environmental trends

There have been major improvements in general water quality leading to more sustainable fish populations on many rivers. Serious pollution incidents, resulting in major fish kills, have also decreased markedly since the last survey. However such incidents do still occur. There are still concerns about the level of some environmental toxins, particularly those which can accumulate through the food chain. Environmental surveillance, partly through the existing programme of otter post-mortem and ecotoxicological analysis, needs to be maintained to address these concerns. The increases in otter range in Wales have taken place within the context of river habitats which have been highly modified in many lowland areas, causing damage to the ecology. The requirement under the Water Framework Directive to bring all watercourses up to good ecological status (or full ecological potential for artificial and heavily modified watercourses) will create the conditions necessary to allow sustainable fish populations to develop. This in turn is a pre-requisite for a healthy otter population.

Other issues

One of the consequences of this recovery has been the increase in reported road deaths, and the number of accidental deaths of otters remains a cause for concern. Nearly 250 otters are known to have been killed on the roads in Wales since the last survey in 2000-02 and this is certainly an underestimate. Deaths in fish and crustacean traps remain a concern and with higher numbers of otters using coastal habitats, deaths in lobster and crab pots may become a serious issue around the Welsh coast. Another consequence of the recovery of otter populations has been increased concern about predation, particularly on specimen fish in still water fisheries and rivers. This creates a challenge to all those involved in river, wetland and fishery management to ensure that the successful return of our top freshwater predator is not seen as a long-term problem for fisheries but as a symbol of a healthy ecosystem.

Conclusions

Recovery has been in response to three main factors, the ban on pesticides that caused extinction of otters from many parts of England and Wales in the 1960s and early 1970s, legal protection for the otter since 1978, and the significant improvement in water quality in Welsh rivers since the 1970s.
The recovery has been the result of natural expansion from the remnant populations, without the need for reintroduction (as elsewhere in the UK). The prospect for full recovery across Wales is very probable within the next

decade. This represents a major success story for pollution control, as well as investment by the water industry and efforts by landowners and river managers to improve river and riparian habitat. Tracking the otter's recovery has demonstrated the benefits of long-term monitoring and the use of this iconic species to raise awareness of pollution problems and the benefits of action to improve the environment.

Spot the otter! Weir on the western Cleddau outside the County Hall in Haverfordwest (Photo: T. Theobald.)

CONTENTS

1. INTRODUCTION

1.1 Background

A systematic survey to assess the distribution and status of the Eurasian otter (*Lutra lutra*) in Wales was carried out between July 2009 and March 2010. This was the fifth in a series of surveys covering Wales, the first of which was completed in 1978. Similar surveys of England and Scotland were undertaken over approximately the same period. The interval between the various surveys in each country was seven years and it is entirely as a result of this survey effort that it has been possible to monitor for the recovery of otter populations in Britain. These repeated surveys mean that otters in Britain have a better known distribution than almost any other mammal species worldwide.

In Wales complete coverage was undertaken by sampling every 10km square. Some 1108 survey sites across the 15 Hydrometric Areas comprise the Welsh dataset.

In England and Wales otters declined very severely during the 1950's to 1970's. The species was lost in many areas by the nadir of the late 1970's. The fourth national surveys in England and Wales have indicated that recovery was well underway in many areas particularly on the western side of Britain. In Wales the total percentage of sites positive was 72%. However some Hydrometric areas showed a slow recovery and some areas e.g. parts of the south east and on Anglesey showed very few signs of otters at all.

As a result it was decided that a further survey was essential to determine the strength of the recovery. In addition both the UK Biodiversity Action Plan (BAP) and the European Union Habitats Directive place obligations on the UK Government to undertake surveillance of otters. The species is listed as a BAP Priority Species for which a UK Action Plan has been published. The plan specifies a requirement to 'monitor populations and distribution of otters throughout the UK, including local survey to monitor the expansion of fringe populations.'
The provisions of the EU Directive require Member States to introduce a range of measures, including:

- Maintain or restore European protected habitats and species listed in the Annexes at a favourable conservation status as defined in Articles 1 and 2;
- Undertake surveillance of habitats and species (Article 11),
- Ensure strict protection of species listed on Annex IV (Article 12 for animals).
- Report on the implementation of the Directive every six years (Article 17), including assessment of the conservation status of species and habitats listed on the Annexes to the Directive.

In order to fulfil these obligations it was decided as a minimum to re-survey all the sites previously surveyed over the period 2009-10. This report on the Fifth National Survey of Wales is to fulfil that requirement.

1.2 Aims and objectives

The overall aim was to replicate as closely as possible the previous surveys, to allow meaningful comparisons to be made with the data from previous surveys with a high level of confidence and adding to our understanding of the distribution and spread of otters within Wales.

The 2009-10 survey had the following objectives:

- To assess whether otter presence was continuing in areas which were positive in previous surveys.
- To assess whether otters were continuing to recover in places with low levels of activity in 2002, as reported in the Fourth National Survey for Wales.
- To assess trends in otter populations in the whole of Wales.

2. METHODS

The fifth otter survey of Wales was undertaken by experienced expert volunteer surveyors drawn from across Wales including EAW Biodiversity Staff, Wildlife Trust Staff, lBAP officers, local mammal groups and local naturalists coordinated by Rob Strachan as EAW survey manager in association with The Snowdonia Mammal Group.
Most of the sites were surveyed via a series of survey weekends and catchment targeted survey days around Wales. A technique tried and tested by the Snowdonia Mammal Group/Dwyryd Otter Partnership (Hall 2002, Hall & Williamson 2003, Strachan et al 2006, Williamson et al 2007.)
Expert volunteer assistance had also been used for some catchments (namely the Ely, Loughor, Tywi and Ystwyth).
In addition to expert and experienced volunteers there has been an opportunity to provide training for inexperienced volunteers by double manning at survey sites during the targeted catchment survey days and weekends.
All travel expenses incurred by volunteers was met for each survey catchment. For survey weekends cost of venue hire and B&B accommodation were also met. This way the total costs of the whole programme of work had been bared down to the minimum without reducing the total number of the survey sites to achieve full coverage.
The various survey days were conducted between the period July 2009 to March 2010 (see table 1)

2.1 Site selection

Most of sample sites are those that were visited during the previous otter surveys. Table 1 shows the total number of sites per Hydrometric area that are to be included within the full survey. Surveys were at the same sites and the same bank and direction of survey as carried out in previous surveys wherever possible. The Survey Manager provided each survey day with a complete list of all the previous national otter survey sites (by 6 figure grid

reference) and the relevant survey sheets. (See Appendix 1 for example of survey sheet). These were provided electronically and also in paper form for site use.

Hydrometric Area	Number of sites	Survey dates
Anglesey	40	July 2009
Cleddau	67	Sept 2009
Clwyd	36	June 2009
Conwy	36	May 2009
Dee	59	June 2009
Dyfi/Mawddach	97	Nov 2009
Glaslyn/Lleyn	99	July 2009
Loughor	50	Feb-March 2010
Mid Glam	61	Oct 2009
Severn	101	July – Aug 2009
Taff	42	August 2009
Teifi	74	August 2009
Tywi	90	Sept 2009
Usk	62	Feb 2010
Wye	129*	Feb - Mar 2010
Ystwyth	65	July-Aug 2009
Total	**1108**	

Table 1: Number of survey sites in each Hydrometric Area and dates surveyed.
*NB: An additional 7 survey sites were incorporated into the Wye Hydrometric area to improve coverage of the upper catchment

2.2 Fieldwork methodology

In order to maximise comparability, the exact mapped and referenced sites as used in all previous surveys were revisited. The survey methodology followed that of the previous Otter Surveys of Wales (Crawford, Evans, Jones & McNulty 1979, Andrews & Crawford 1986, Andrews, Howell & Johnson 1993, Jones & Jones 2004).

At each site, a distance of up to 600 m of one bank of a watercourse/coastline was searched following the easiest route along the river bank (and usually up to 300m upstream and 300m downstream from the bridge access point). The route to be taken and the bank to be walked had been pre-drawn on the map within the survey sheets provided. However, both sides of any bridge were searched where it was safe to do so.

Surveyors would, wherever possible, repeat the previous survey by following the line shown. In a small number of cases this was not possible either because of physical changes to the site or the refusal of access. In these cases surveyors could choose an alternative as close to the original site as possible and contact the survey manager to inform of these changes.

Surveying ceased when the first otter spraint or footprint was located and so confirming otter presence at the site or when the entire 600m has been surveyed (in those cases where no evidence of otters could be found).

Surveyors also recorded the signs of other riparian mammals encountered during the survey, especially the water vole (*Arvicola amphibius*) and mink (*Neovison vison*). However it should be emphasised that this was an otter survey and no additional time was spent on surveying for these species. Other notable species such as polecat, kingfisher, dipper, dragonflies and notable non-native invasive species (such giant hogweed or signal crayfish) were also recorded in the comments section on the survey form.

2.3 Recording site information

Printed survey sheets were provided for each site showing the start point and the bank and reach to be surveyed (see Appendix 1 as an example). The survey sheets had been simplified from those used during the previous surveys with the emphasis on recording where the surveyor went and what was found rather than collecting habitat data.

2.4 Biosecurity

In some areas of Wales there are populations of introduced Signal Crayfish which carry crayfish plague. In such areas strict Biosecurity measures were observed to prevent the movement of crayfish plague spores from catchments with signal crayfish to those with native white-clawed crayfish (such as the River Wye). In these cases it was essential that surveyors cleaned their waders or boots with a disinfectant spray. The Environment Agency provided appropriate sterilising solution and a hand spray for this purpose.

2.5 Access arrangements

All surveyors were responsible for gaining access to the individual survey sites as in previous surveys. At each site it was decided if permission should be asked for and from whom, usually by knocking on doors on the day of the survey. However to facilitate access the Environment Agency provided letters for surveyors to carry explaining the purpose of the work. In a few cases access was refused and the survey site was relocated to the nearest adjacent access point on the watercourse as close to the original as possible.

2.6 Health and Safety

All surveyors had legal responsibilities under the Health and Safety at Work Act to ensure their personal health and safety. As such the surveyors were required to take into account the extra care which was needed to survey some sites, particularly if in remote areas. On some sites surveyors may have encountered difficult terrain and unpredictable weather. A risk assessment was completed by all surveyors before the work was undertaken. Lone working procedures were followed but in most cases paired working was the preferred method for the survey days. Before any field work was undertaken the EAW Survey Manager had to be satisfied that fieldworkers were equipped with suitable personal protective equipment, such as a wading staff and a suitable lifejacket.

2.7 Timing and Weather Conditions

In order to minimise seasonal differences, the survey programme sought to visit sites as close as possible to the dates of the 2002 survey. Due to the

targeted nature of the survey methodology, some hydrometric areas could be completed in a single day with the volunteer survey team. Where expert volunteers took on a catchment the work was completed over a number of weeks working to favourable weather conditions.
Weather conditions were generally good, however some significant rainfall was noted within certain Hydrometric areas that may have influenced the results of the surveys (such as the Glaslyn and Dyfi Hydrometric areas). Where these were noted they have been highlighted in the discussions for those Hydrometric areas, and re-surveys or spot checks undertaken to complement the overall picture. The results of the re-surveys were not used in the main data analysis.

Pont Coed Felin, Afon Prysor, Gwynedd. Survey sites often started at a bridge as an access point and continued upstream and downstream for 300m each side or until the first signs of otter evidence was located. (Photo: R. Strachan)

Tracks of an otter at the waters' edge and a fresh spraint on fallen masonry under a bridge (a 50p coin is used to show scale). (Photo: R.Strachan)

3. RESULTS

3.1 Overall Results

Hydrometric Area	Number of sites	Number positive in 2002		**Number positive in 2009-10**	
		number	percentage	**number**	**percentage**
Anglesey	40	7	18%	**27**	**67.5%**
Cleddau	67	64	97%	**65**	**97.0%**
Clwyd	36	32	89%	**34**	**94.4%**
Conwy	36	28	78%	**34**	**94.4%**
Dee	59	46	78%	**55**	**93.2%**
Dyfi/Mawddach	97	56	58%	**76**	**78.4%**
Glaslyn/Lleyn	99	47	48%	**91**	**91.9%**
Loughor	50	39	78%	**50**	**100.0%**
Mid Glam	61	11	18%	**43**	**70.5%**
Severn	101	87	86%	**95**	**94.1%**
Taff	42	21	50%	**33**	**78.6%**
Teifi	74*	72	97%	**71**	**95.9%**
Tywi	90	68	76%	**85**	**94.4%**
Usk	62	48	80%	**55**	**88.7%**
Wye	129**	112	92%	**124**	**96.1%**
Ystwyth	65	47	72%	**58**	**89.2%**
OVERALL	1108	784	73%	**996**	**89.9%**

Table 2: Results of the Otter Survey of Wales 2009-10, overall and for each of the 16 hydrometric areas, and comparison with results recorded in the 2002 survey. For the purposes of analysis Hydrometric Area 66 covering Conwy and Clwyd has been split.

*Notes: * Seventy-five full survey sites were recorded during the 1991 survey, but only seventy-four field survey sheets were available for the 2002 and 2009-10 surveys.*
*** An additional 7 survey sites were incorporated into the Wye Hydrometric area to improve coverage of the upper catchment.*

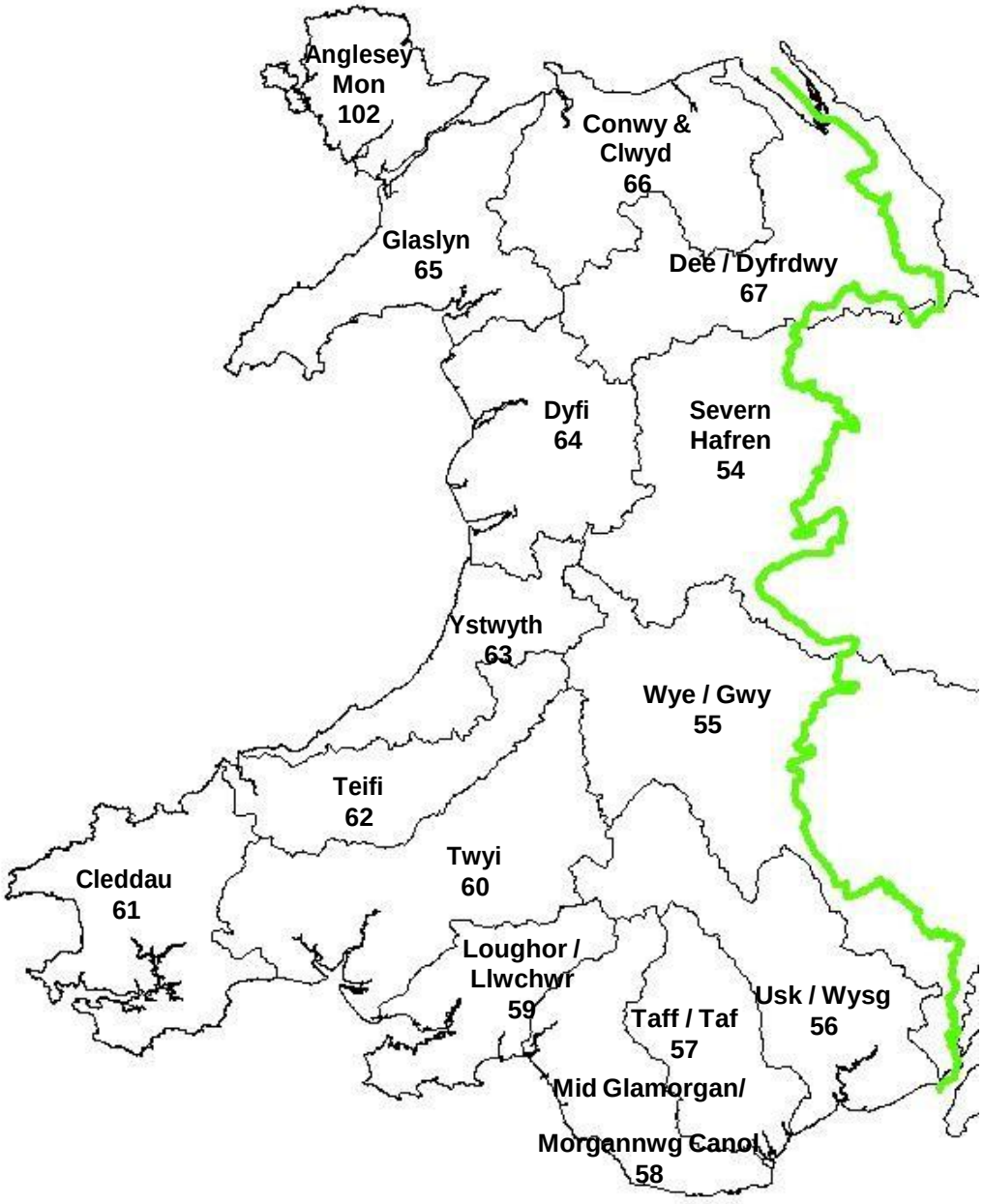
OTTER SURVEY OF WALES 2009 - 10

The overall results of the 2009-10 Otter Survey of Wales are presented in Table 2 and Map 2. A comparison with the Otter survey of Wales 2002 is also given (Map 3). Four hydrometric areas were of particular concern in 2002 – highlighted in red – and these now have shown an impressive expansion in sites occupied by otters. The results of the previous surveys are shown in Map 4 (results by catchment 1991), Map 5 (results by catchment in 1984-85) and Map 6 (baseline survey results for 1977-78). Out of 1108 sites surveyed across Wales in 2009-10, only 112 were negative for otters at the time of survey (Map 7).

Otter spraints of various ages on masonry under a bridge over the Brecon and Monmouth Canal within the Usk catchment. Acids leaching from the spraints have turned the grass brown. (Photo: R.Strachan)

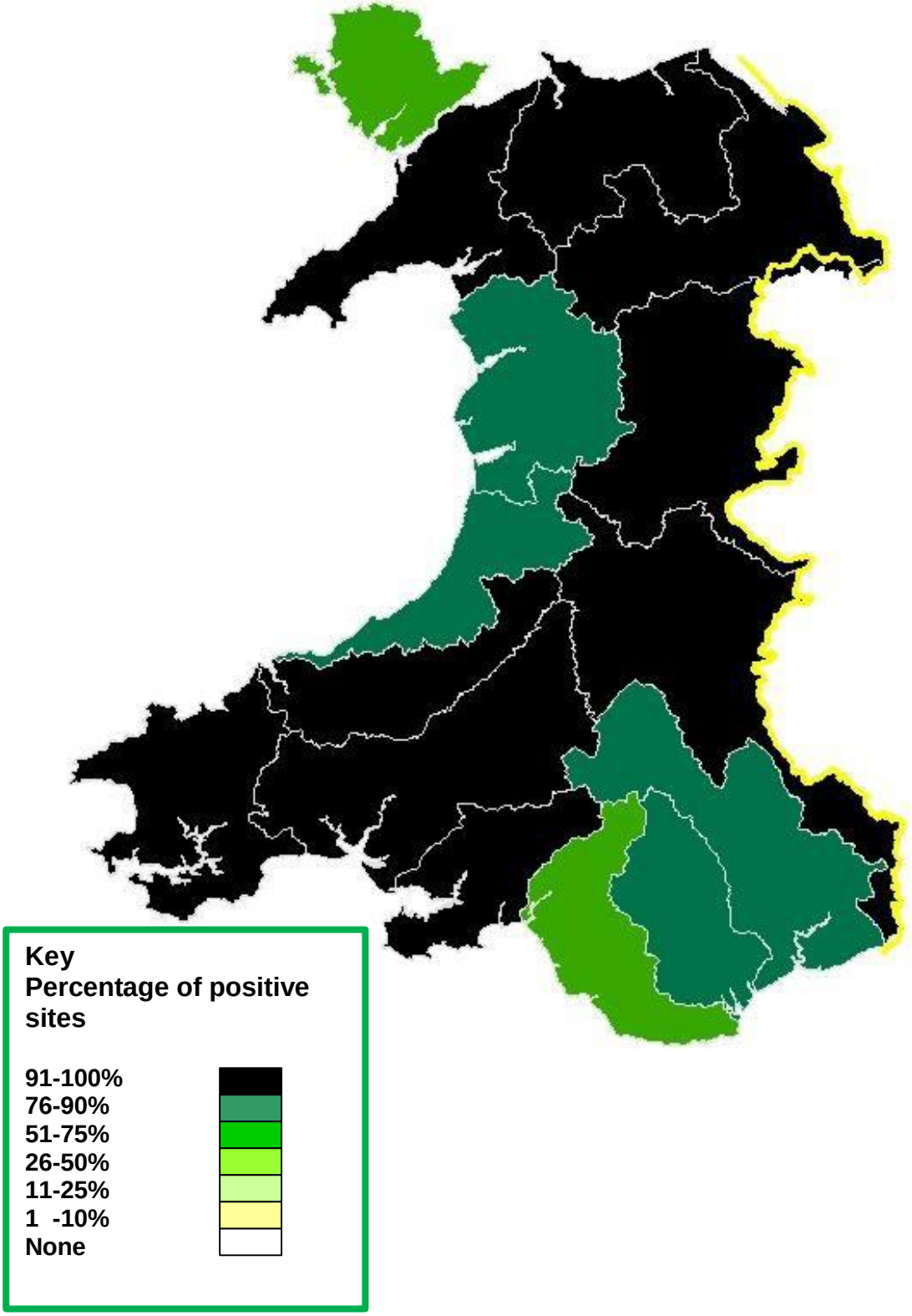
OTTER SURVEY OF WALES 2009 - 10

MAP 1: HYDROMETRIC AREAS OF WALES



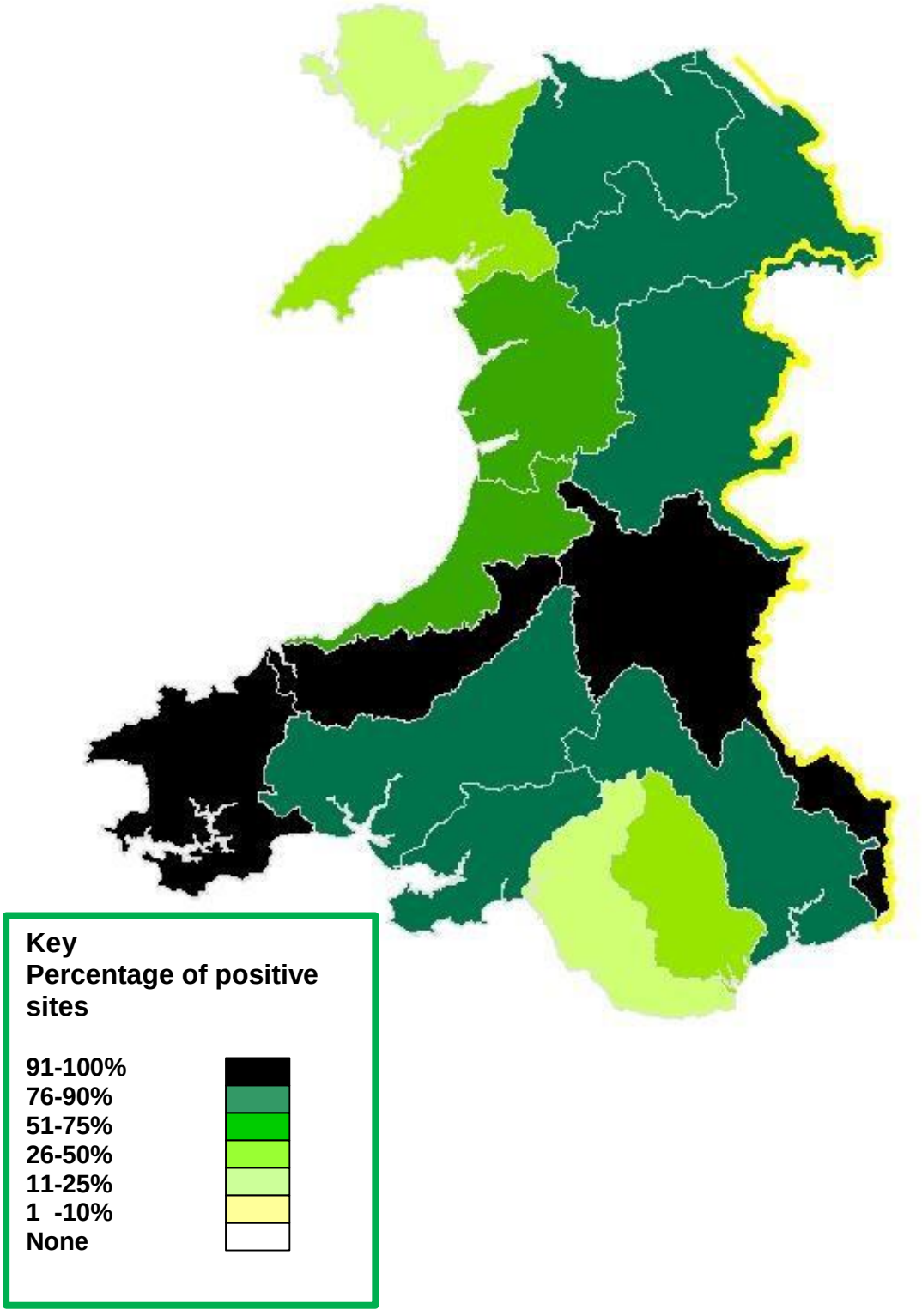
OTTER SURVEY OF WALES 2009 - 10

MAP 2: OTTER SURVEY OF WALES 2009-10



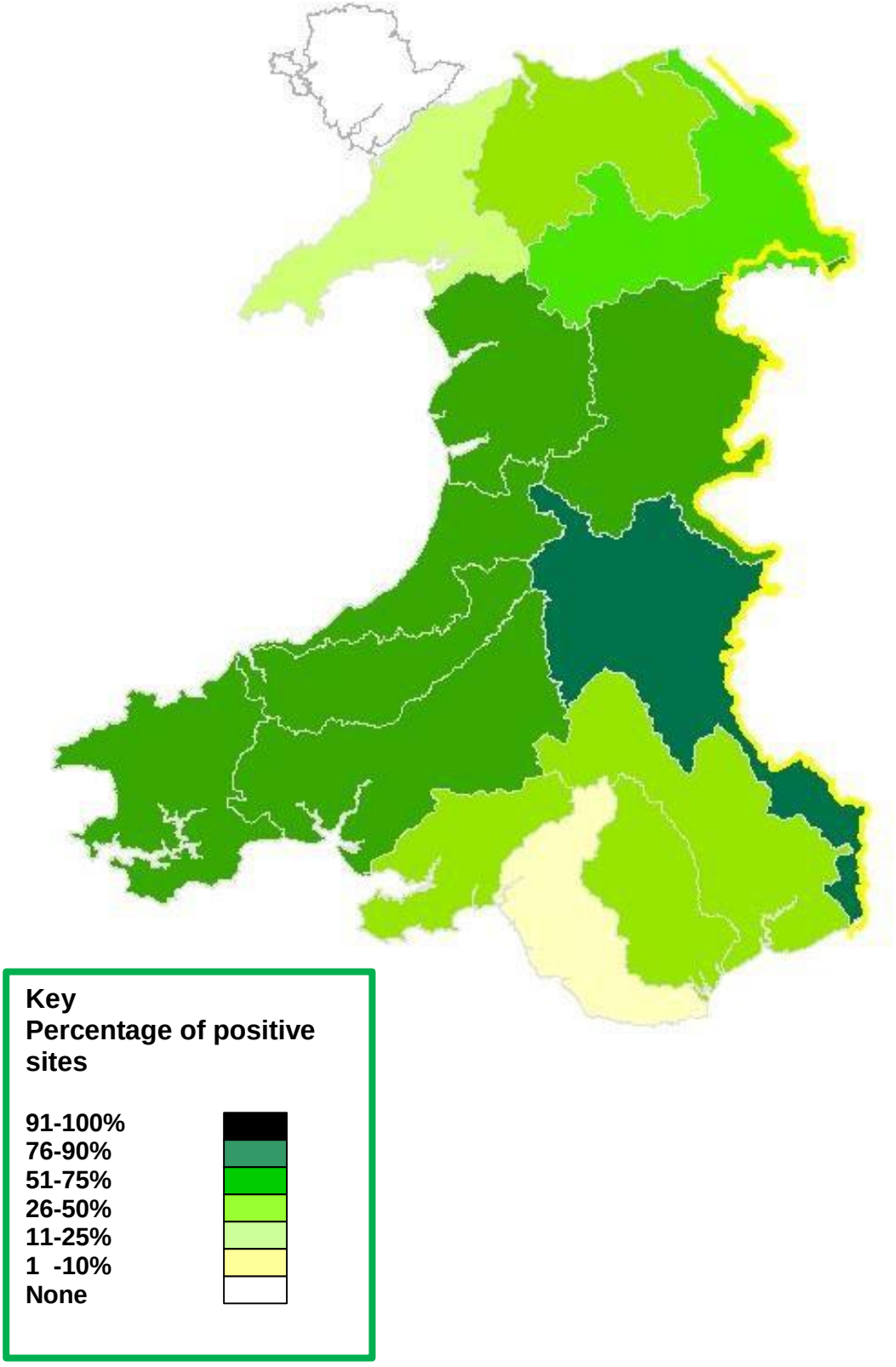
OTTER SURVEY OF WALES 2009 - 10

MAP3: OTTER SURVEY OF WALES 2002



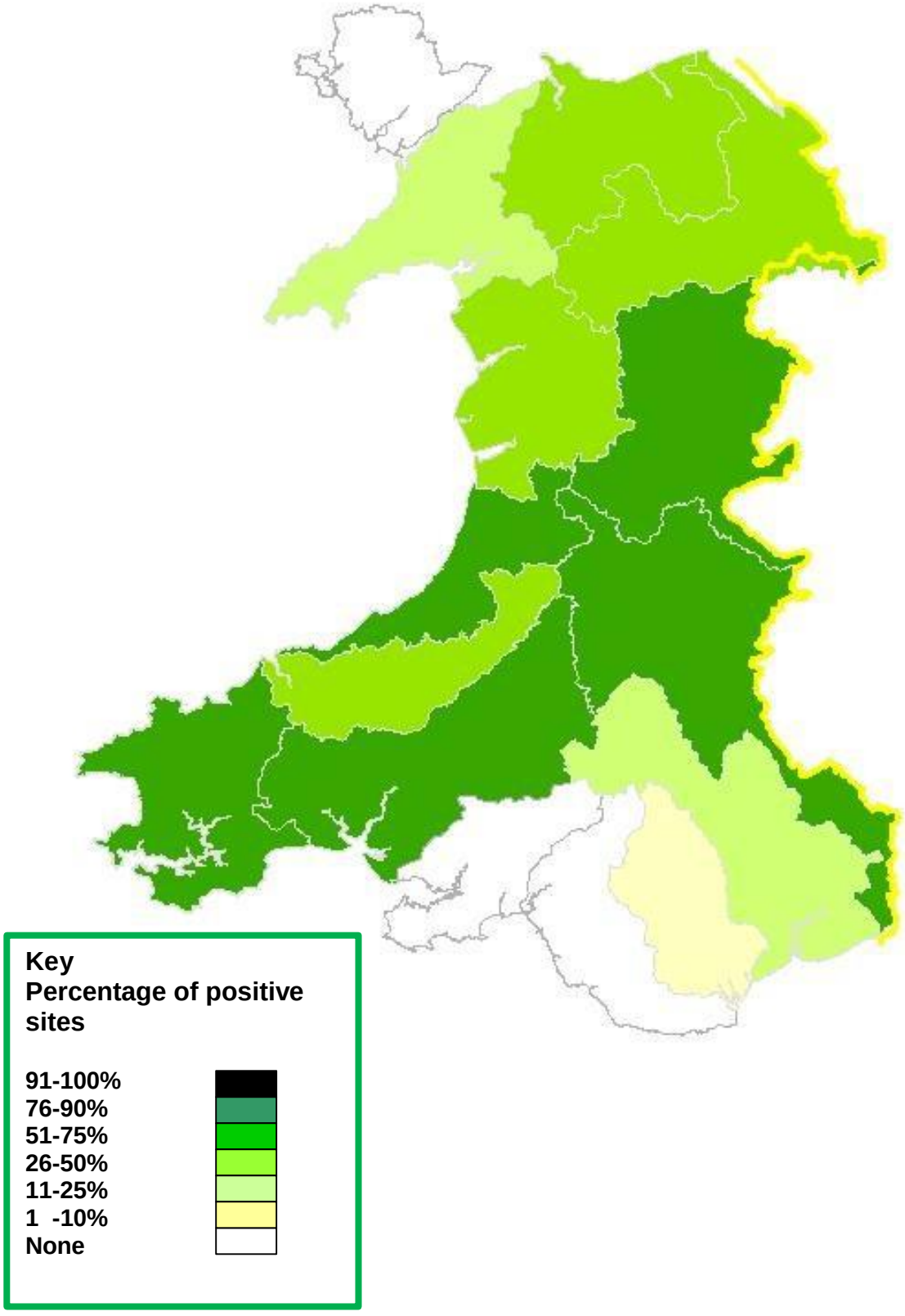
OTTER SURVEY OF WALES 2009 - 10

MAP 4: OTTER SURVEY OF WALES 1991



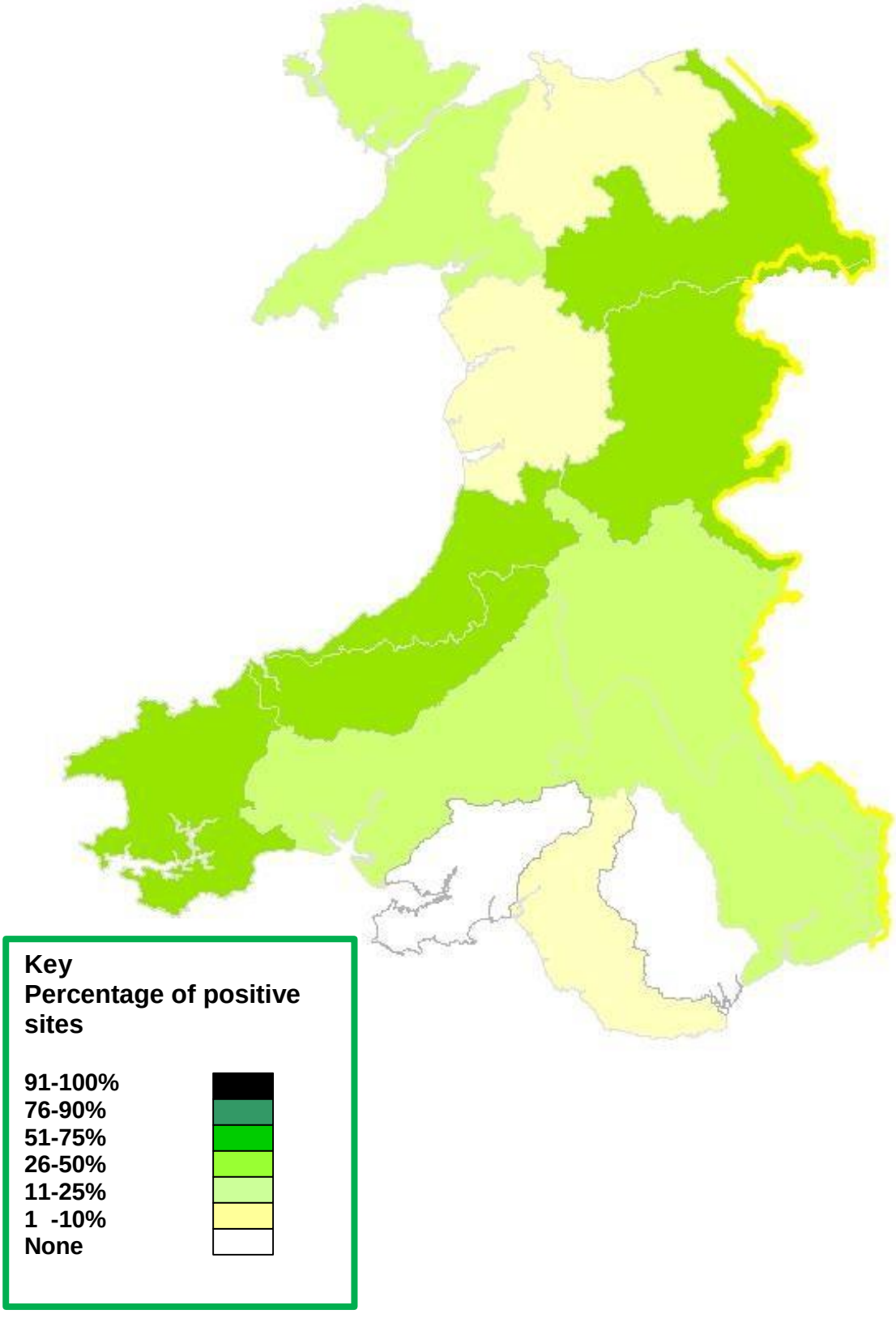
OTTER SURVEY OF WALES 2009 - 10

MAP 5: OTTER SURVEY OF WALES 1984-85



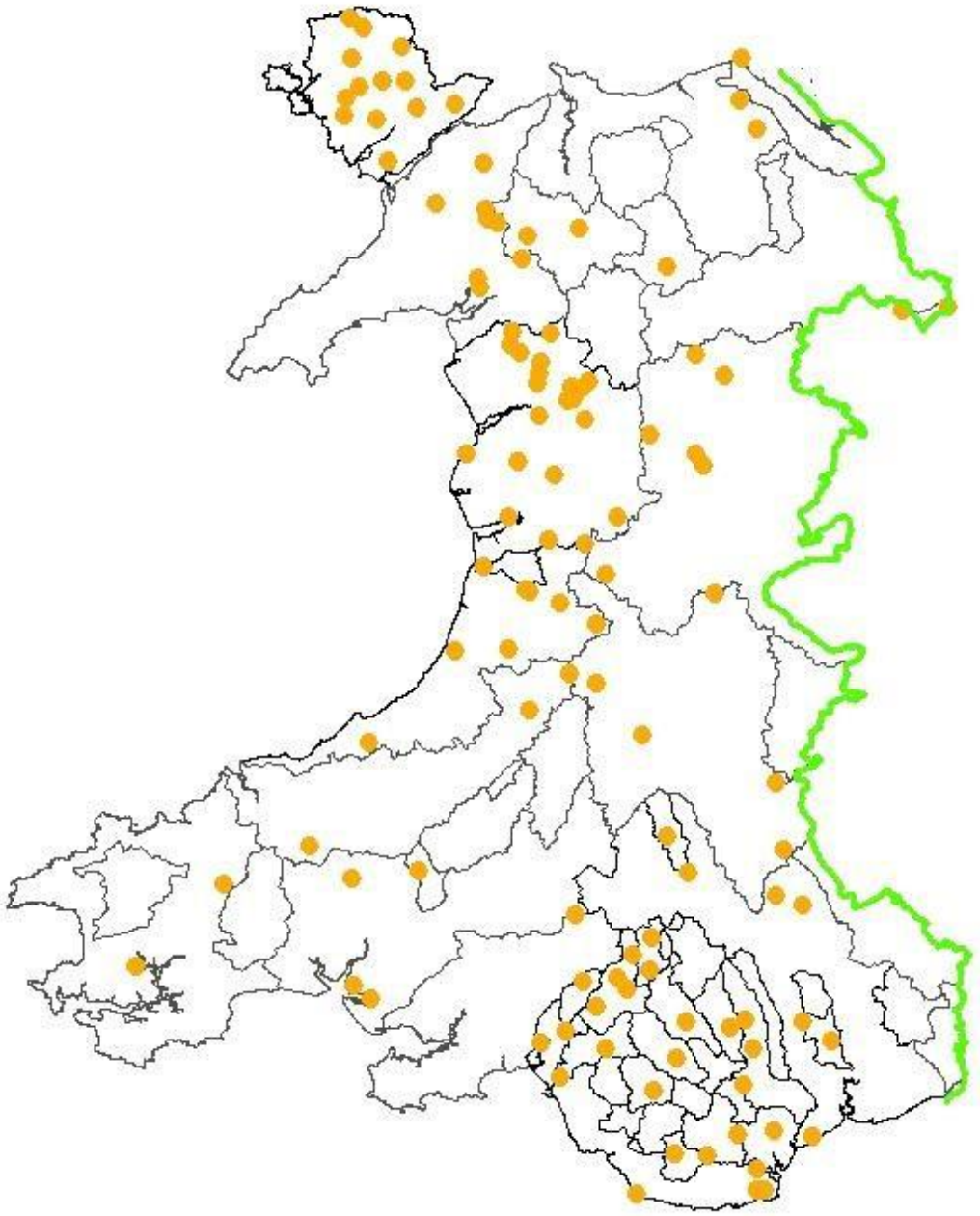
OTTER SURVEY OF WALES 2009 - 10

MAP 6: OTTER SURVEY OF WALES 1977-78



OTTER SURVEY OF WALES 2009 - 10

MAP 7: DISTRIBUTION OF NEGATIVE SITES 2009-10



3.2 Comparison of Surveys

1008 survey sites were common to all surveys as established in the 1977-78 baseline. Table 3 and Figure 1 compares the change in percentage of sites occupied by otters within each hydrometric area for each of the five surveys, 1977-78, 1984-85, 1991, 2002 and 2009-10 using the results of those sites common to all surveys. These are also depicted in maps 2,3,4,5 & 6.

Hydrometric Area	Number of sites in common	Percentage of positive sites				
		1977-78	1984-85	1991	2002	2009-10
Anglesey	39	18%	0%	0%	18%	69%
Cleddau	56	41%	54%	71%	97%	97%
Clwyd	27	4%	33%	63%	96%	96%
Conwy	31	3%	19%	35%	90%	96%
Dee	53	30%	40%	49%	87%	94%
Dyfi/Mawddach	92	10%	32%	52%	58%	78%
Glaslyn/Lleyn	92	18%	18%	17%	39%	94%
Loughor	47	0%	0%	47%	81%	100%
Mid Glam	53	2%	0%	2%	21%	72%
Severn	101	40%	67%	67%	86%	94%
Taff	21	0%	5%	29%	76%	80%
Teifi	73	38%	40%	59%	97%	96%
Tywi	86	14%	67%	69%	77%	95%
Usk	56	11%	25%	50%	82%	90%
Wye	118	24%	62%	83%	94%	97%
Ystwyth	63	30%	60%	73%	73%	90%
OVERALL	**1008**	**20%**	**38%**	**53%**	**74%**	**89%**

Table 3: Percentage of positive sites for all Hydrometric area survey sites that were common to the five surveys

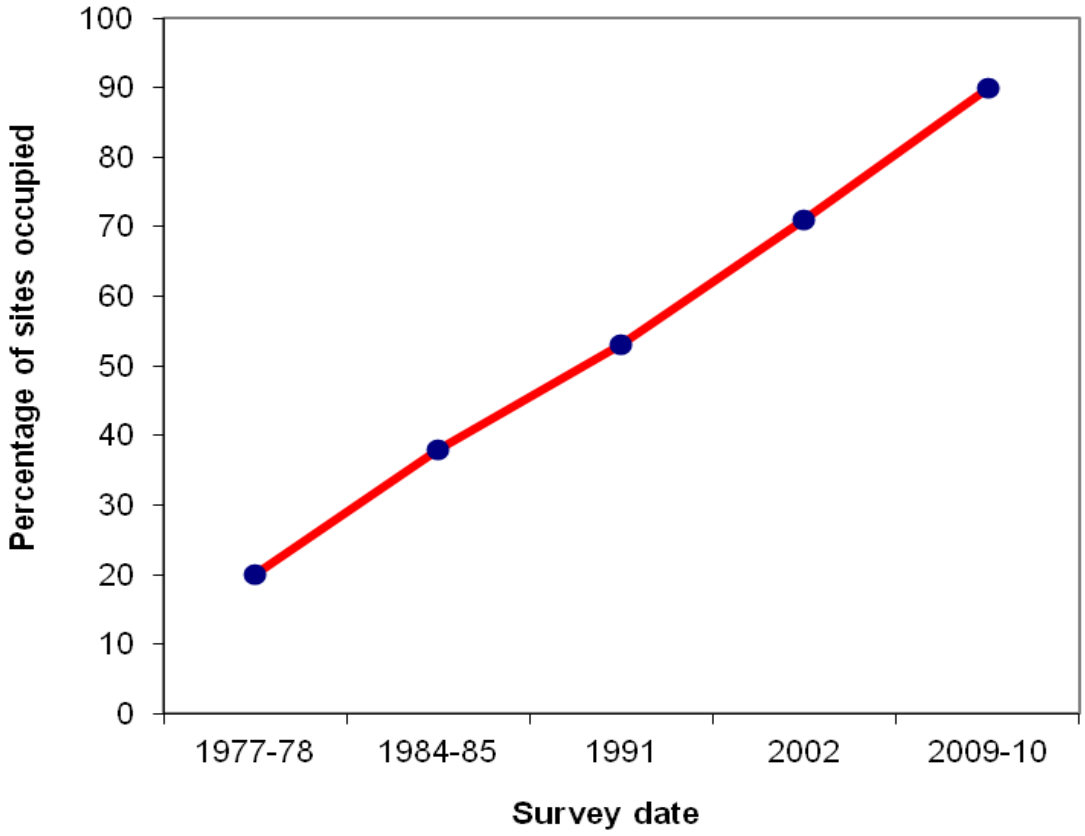


Figure 1: Overall change in the percentage of sites occupied by otters between 1977 and 2010 as described by the five national surveys for Wales.

Overall the rate of sites occupied by otters has increased at a steady 24 new sites per year on average since the 1977-78 baseline survey.
Expressed as a fitted straight line formulae the number of sites occupied in any year was y = 188 + 24.2x. This predicted that 100% occupation of all 1108 survey sites would take at least 38 years from the date of the first survey. This gives a date of full occupancy expected from the year 2016. However it is likely that the snap shot nature of the survey will always find some sites unoccupied, even when catchments are at carrying capacity, as the survey was not designed to find all the otters but to show the trends in relative status and distribution.

Table 4 shows the percentage change and statistical significance between surveys carried out in 2002 and 2009-10

Hydrometric Area	Percentage Increase between 2002 and 2009-10	2X2 Chi-squared contingency test	Statistical significance (1df: 0.5>p = Not significant 0.5<p<0.1 = * 0.1<p<0.01= ** 0.01 <p<0.001=***)
Anglesey	285.7%	χ^2= 62.51	***
Cleddau	3.2%	χ^2= 01.06	*
Clwyd	6.2%	χ^2= 01.12	*
Conwy	21.4%	χ^2= 05.78	**
Dee	19.9%	χ^2= 07.99	**
Dyfi/Mawddach	33.4%	χ^2= 15.25	***
Glaslyn/Lleyn	93.6%	χ^2= 78.42	***
Loughor	28.2%	χ^2= 14.10	***
Mid Glam	291.6%	χ^2= 113.57	***
Severn	9.2%	χ^2= 06.34	**
Taff	57.1%	χ^2= 13.71	***
Teifi	-1.4% decrease	χ^2= 00.43	NS
Tywi	25.0%	χ^2= 17.38	***
Usk	14.6%	χ^2= 02.58	*
Wye	4.7%	χ^2= 10.91	***
Ystwyth	23.4%	χ^2= 9.29	**
OVERALL	31.8%	χ^2= 188.71	***

Table 4: Percentage change in positive sites for all Hydrometric areas between 2002 and 2009-10 surveys

Table 5 shows the percentage change and statistical significance between surveys carried out 1977-78 and 2009-10

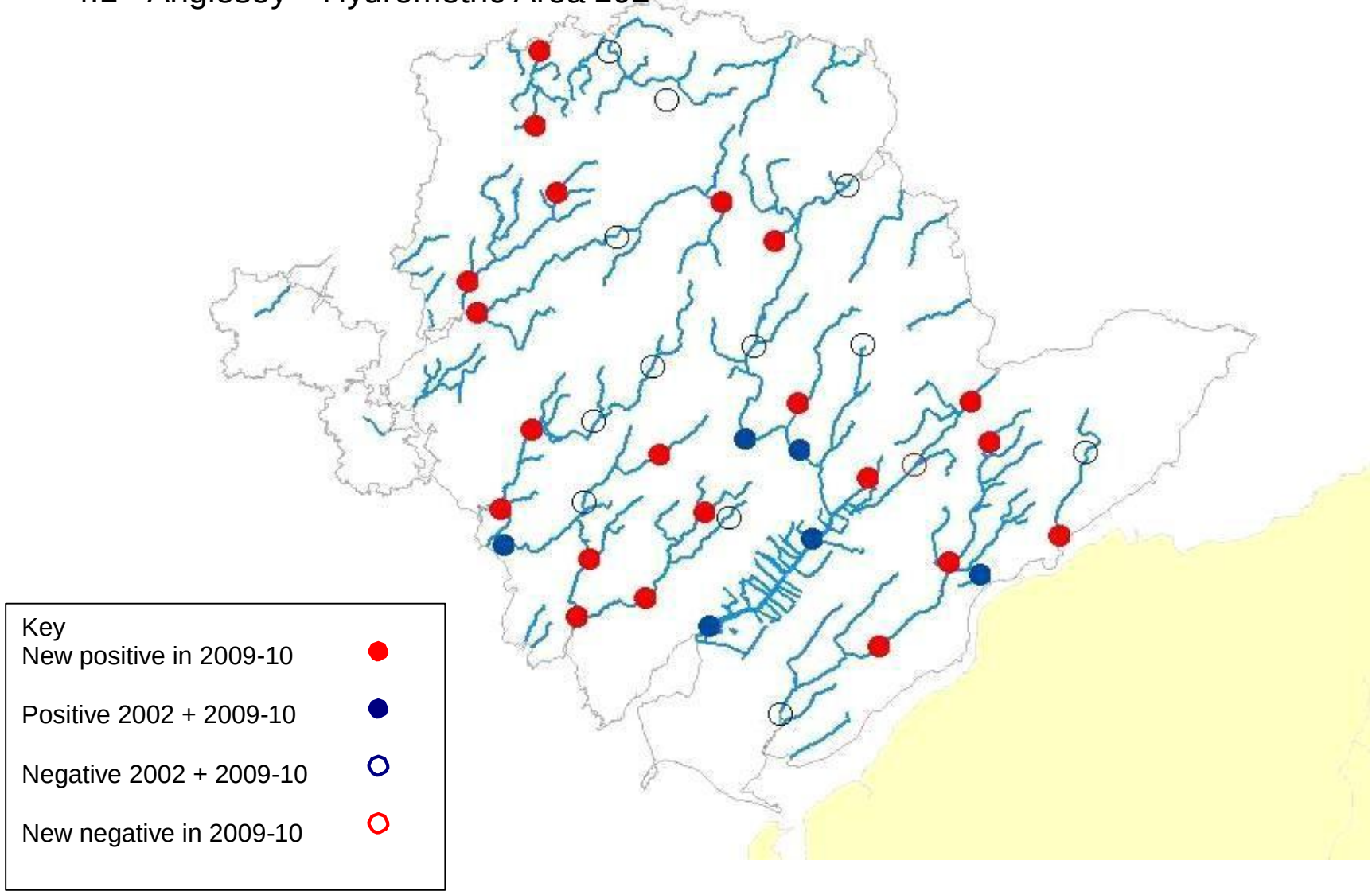
Hydrometric Area	Percentage Increase between 1977-78 and 2009-10	2X2 Chi-squared contingency test	Statistical significance (1df: 0.5>p = Not significant 0.5<p<0.1 = * 0.1<p<0.01= ** 0.01 <p<0.001=***)
Anglesey	285.7%	χ^2= 62.51	***
Cleddau	136.2%	χ^2= 105.81	***
Clwyd	2447.7%	χ^2= 1111.15	***
Conwy	2922.2%	χ^2= 1116.13	***
Dee	208.8%	χ^2= 124.49	***
Dyfi/Mawddach	811.0%	χ^2= 626.19	***
Glaslyn/Lleyn	402.8%	χ^2= 388.89	***
Loughor	∞	χ^2= ∞	***
Mid Glam	3625.5%	χ^2= 1786.23	***
Severn	137.4%	χ^2= 125.21	***
Taff	∞	χ^2= ∞	***
Teifi	150%	χ^2= 105.24	***
Tywi	585.3%	χ^2= 509.42	***
Usk	728.2%	χ^2= 437.15	***
Wye	304.9%	χ^2= 409.41	***
Ystwyth	195.7%	χ^2= 111.17	***
OVERALL	349.5%	χ^2= 3576.98	***

Table 5: Percentage change in sites found positive for all Hydrometric areas from 1977-78 baseline data to 2009-10

4.0 Results by Hydrometric area

Female otter with cub at Llyn Bach, Porthmadog 2009 (Photo: R. Strachan)

4.1 Anglesey – Hydrometric Area 102



4.1 Anglesey – Hydrometric Area 102

General Description

The Anglesey hydrometric area consists of Anglesey itself and Holy Island. The landscape is gently rolling with predominantly low lying ground under 100m. There are some isolated hills to the north east and the highest peak is Holyhead Mountain at 220m. Across the island the farming is sheep and dairying but with some local arable crops. Tourism is important, especially on the coast, where there are many EC designated bathing waters and opportunities for water based recreation including angling, sailing and canoeing. The development of the A55 link to Holyhead has led to significant improvement to the highway access routes on the island. The largest urban areas are Holyhead and Llangefni and the area around Menai Bridge and Llanfairpwllgwyngyll.

None of the rivers on Anglesey exceed 25km in length and generally they are narrow with the exception of some of the tidal reaches. This shortness of length could have consequences for the carrying capacity of the watercourses for otters in terms of prey availability on some parts of the island. Some of the rivers have also been canalised, for example the Cefni downstream of Llangefni. Throughout the island the rivers are of low gradient and low energy, with generally good bankside vegetation, giving good cover for wildlife. Wetlands are an important feature of the hydrometric area with Malltraeth Marsh (managed by the Royal Society for the Protection of Birds) being a focal area for otters on the island as a breeding centre. Malltraeth Marsh offers a protected network of ditches and a series of pools and extensive reed beds.

Anglesey has a number of lakes that are impacted by nutrient enrichment, while diffuse inputs, such as sediments from both agriculture and forestry, affect the biological quality of the various river catchments. Historically, metal mining was an important industry in this part of Western Wales. A legacy of this still exists today, with abandoned mines, including the Parys Mountain copper mine on Anglesey, giving rise to elevated metal levels in downstream rivers, which sometimes directly affect ecological quality.

Brown trout and eels are widespread in the rivers and coarse fish have been introduced into a number of lakes. With migratory salmonids entering some of the larger watercourses the fish stocks on Anglesey are generally good, and should not prove a limiting factor for otter distribution. In addition to freshwater habitats, the marine environment surrounding Anglesey may provide excellent inshore foraging for otters, with many protected coves and bays, kelp beds and abundant prey.

OTTER SURVEY OF WALES 2009 - 10

Results of 2009-10 Survey and Comparison with previous surveys.

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

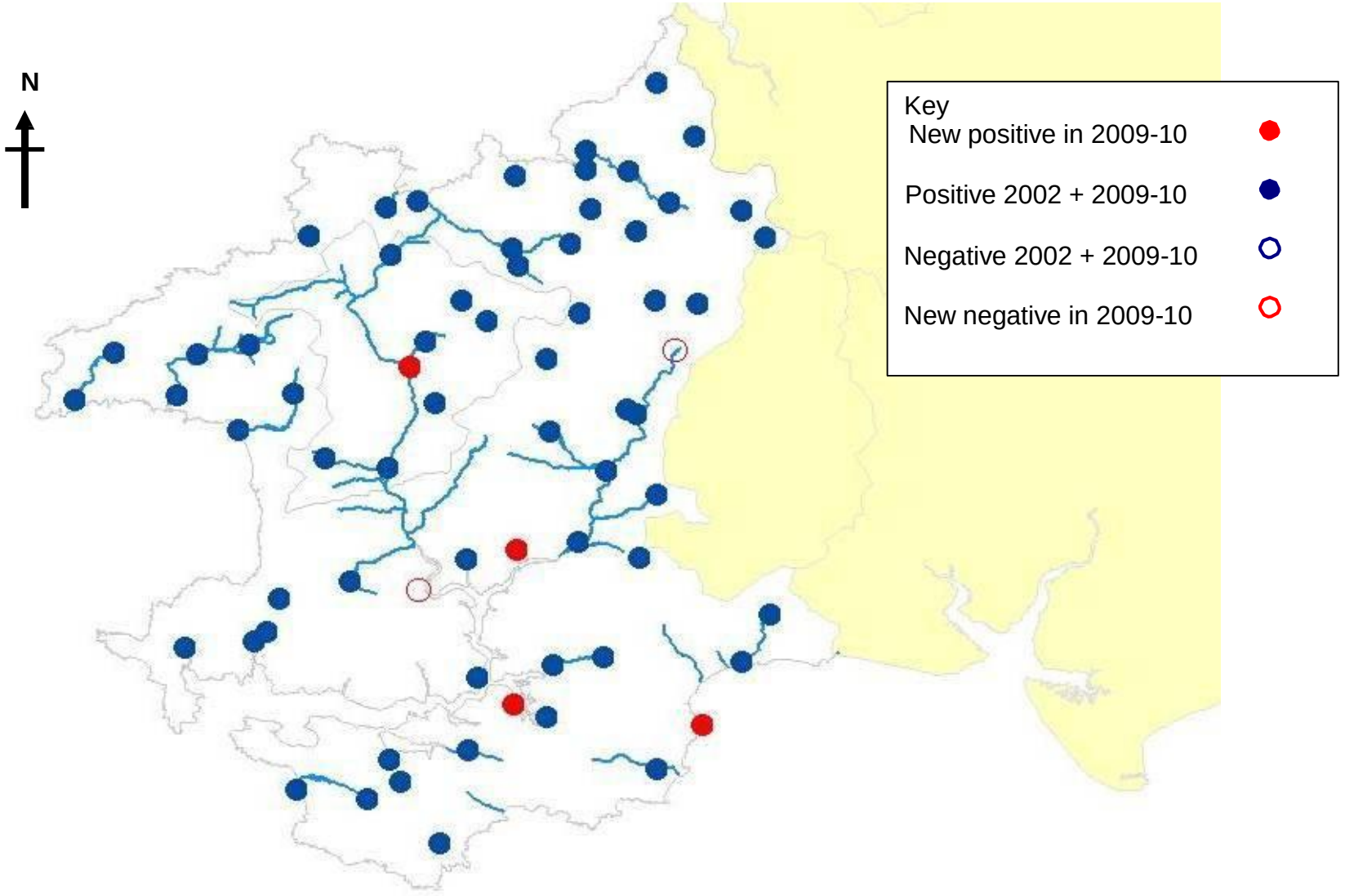
Discussion

The situation in 2009-10 appears to show an impressive recovery to the 2002 position. Comparison of the data indicates that the positive sites have been a consolidation and expansion on those found positive in the 2002 survey, focused on the Cefni and adjacent rivers i.e. those closest to the mainland. This encouraging expansion has been to the west and north of the island, with signs now being found on the Afon Ffraw, Afon Gwna, Afon Crigyll, and Afon Goch. Llyn Alaw and Llyn Llygerian also show evidence that otters hunted those waterbodies.

The recovery on Anglesey undoubtedly reflects that the species is now breeding on the island. However it is also likely to reflect the recently increased numbers of otters in rivers such as the Gwyrfai, Seiont and Ogwen. These are located in the Glaslyn Hydrometric Area, close to the narrow channel separating Anglesey from the mainland, known as the Menai Straits. Sightings of otter families have been reported from the Cefni catchment with probable centres of breeding at Llyn Cefni and Malltraeth Marsh.

Extensive habitat restoration work has been carried out as part of the Menter Môn Otter Project and this has undoubtedly aided otter recovery. There have been a small number of otters killed on the roads in the last seven years, with the A55 posing the greatest risk due to high density of traffic and higher average speeds of vehicles compared to other island roads.

4.2 Cleddau – Hydrometric Area 61



4.2 Cleddau – Hydrometric Area 61

General Description

The Cleddau hydrometric area, comprises two major river catchments, the Eastern and Western Cleddau. The Eastern Cleddau rises in the Preseli Hills and flows in a south-westerly direction to meet the main river stem. The Western Cleddau rises south of Mathry and flows southwards, parallel with the Eastern Cleddau and converging with it south of Haverfordwest, before entering the sea at Milford Haven. The Eastern and Western Cleddau and many tributaries are designated as a Special Area of Conservation (SAC) from its component Sites of Special Scientific Interest (SSSIs). The otter is a feature of the SAC designation, together with good populations of sea lamprey, river lamprey, brook lamprey and bullhead as other Annex II species.

The hydrometric area also includes numerous minor rivers which drain directly into the sea on the northern, western and southern coasts of the Pembroke peninsula, where the Pembrokeshire coast is also a SAC with the otter as a feature. The largest coastal stream is the Afon Nyfer which flows into the sea at Newport Bay.

The landscape character can be described as largely rolling hills with steep-sided valleys, often wooded and with extensive riparian cover, ideal habitat for breeding otters. Farmland is principally used for arable and intensive dairy farming on the rich pasture. Tourism is also a major industry and the human population increases significantly in summer with visitors and holiday makers. Major population centres are at Haverfordwest, Milford Haven and Pembroke. Historically, many of the upper reaches of the Western Cleddau catchment have been engineered and straightened to aid agricultural productivity. However, restoration schemes have been undertaken in some parts to raise water levels in adjacent wetlands together with pond creation work. The Water Framework Directive recognises that there are issues with diffuse pollution throughout the Eastern and Western Cleddau catchments, though in general the water quality is meeting good ecological status, particularly in rivers such as the Afon Nyfer in the north of the hydrometric area.

Fish stocks, and runs of salmonids are fair to good, and significant effort is being expended through partnership projects to improve these fisheries and deliver WFD targets for removal of barriers to fish reaching their spawning sites. A number of lakes provide small commercial trout and coarse fisheries throughout the area. One of the most famous of these is Bosherston Lake, which supports significant populations of coarse species such as pike, tench, roach and rudd, and resident breeding otters that are regularly seen by members of the public.

Results of 2009-10 Survey and comparison with previous surveys.

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

* Fifty-nine sites are noted in the 1977-78 survey report, but only 58 field sheets were available.
** One site could not be surveyed and has not been taken into account in the calculations.

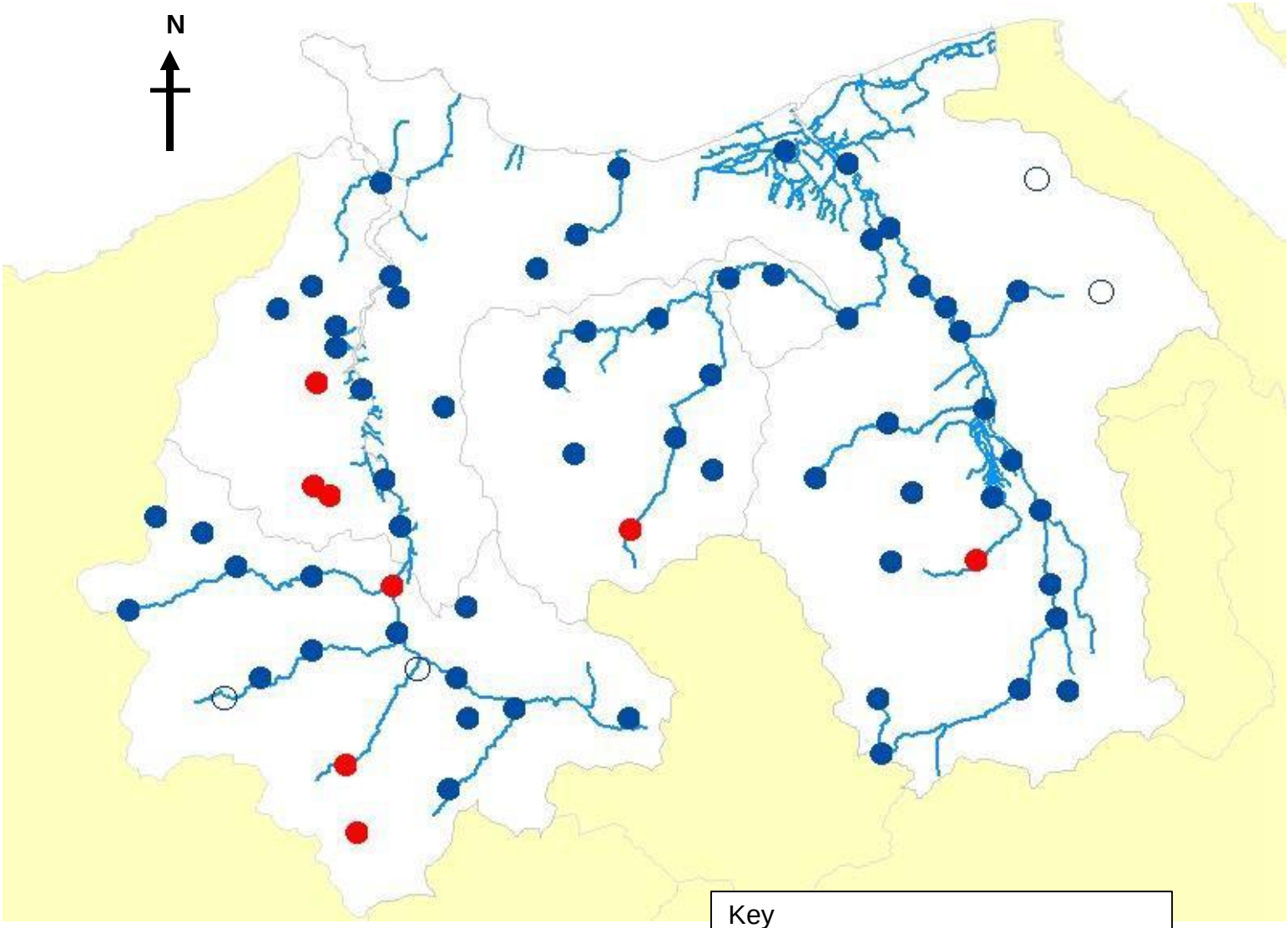
Discussion

The Cleddau hydrometric area has consistently provided some of the highest proportions of positive sites since the first national survey in 1977/8 and the 2009-10 survey was no exception, with 97% of sites positive. This suggests that the catchment may be at, or close to, carrying capacity for otters, with any negative sites reflecting the snapshot nature of the survey rather than a real absence of otters. The four sites that were negative in 2002 are now recorded as positive, but two sites previously positive were negative in the present survey.

As part of the statutory Favourable Conservation Status monitoring of the features of interest, the Pembrokeshire Coast SAC was surveyed for otters by Geoff Liles and others between 2002 and 2009. These surveys included 28 x 1 kilometre stretches within the Daugleddau estuary and 29 open coast sites. In total 49/57 (85.9%) sites were found to contain signs of otter (Liles pers. com). One of the most striking findings of that study was the quality and amount of suitable habitat available to otters, for both breeding and lying up, very close to the coast and Milford Haven Waterway shoreline.

Bosherton Lakes, Stackpole, Pembrokeshire – a hotspot for otters. The Bosherton lakes are well stocked with coarse fish and provide secure natal holts for breeding. As a consequence animals may be sighted most days, especially around dawn and dusk. These two animals were watched fishing for nearly an hour mid-morning in strong sunlight May 2010. (Photo: A. Rivett)

4.3+4.4 Conwy and Clwyd – Hydrometric Areas 66A and 66B



4.3+4.4 Conwy & Clwyd – Hydrometric Area 66

General Description
The Conwy and Clwyd are adjacent but distinct river systems flowing north into the Irish Sea on the North Wales coast.
Agriculture is the main land use, with sheep farming in the uplands and mixed livestock rearing and dairy lower down the catchments. The area relies heavily on the tourism industry, with several EU designated bathing waters including Llandudno, Colwyn Bay and Rhyl.
Each river system is discussed separately below.

4.3 Clwyd – Hydrometric Area 66B

The hydrometric area lies between the North Wales Snowdonia massif to the west and the Clwydian Range to the east. The lowland areas of the main river and its main tributaries, the Elwy, Aled and Wheeler, form the Vale of Clwyd, an area of significant agricultural production, predominantly arable and dairy farming. Sheep rearing is the mainstay of farming in the uplands. The principle towns include Rhyl on the coast, Denbigh, Ruthin and St Asaph, each with local river engineering measures to alleviate flood risk.
The geology is generally base-rich and, therefore, acidification is not an issue over most of the area. The water quality and biology of the Clwyd is impacted by nutrients, from both sewage treatment works effluent and diffuse agricultural inputs. Since 2008 the Environment Agency Wales has targeted the Clwyd for a programme of catchment sensitive farming to help improve water quality.
Fish populations in the rivers are dominated by salmonids and are generally achieving good ecological status under the Water Framework Directive. The lower reach of the Clwyd supports a seasonal influx of flounder and mullet, especially within its estuary and saltmarsh. These areas also act as a nursery ground for species such as sea bass. Coarse fish such as roach and carp have been introduced for angling in a number of still-waters within the catchment. Rural land management, manmade barriers to migration in the Clwyd and some investigative work, all need to be addressed to further improve the fish status.

Results of 2009-10 Survey and Comparison with previous surveys.

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

Discussion
The number of positive sites overall has increased by from 89% in 2002 to 94%, confirming that the otter has made a good recovery on the Clwyd system. Although the improvement between 2002 and 2010 is fairly moderate, the improvement since the very poor results of the first

survey in 1977/8 is dramatic and represents a 2448% increase. Only two sites remained negative in 2009; a tributary of the upper catchment of the Afon Wheeler/Chwiler and a small tributary on the Mostyn Estate. Both sites are unlikely to be frequently visited by otters due to their small size. These two sites were also negative in 2002.

Disused badger outlier hole on floodbank of River Clwyd shows occasional use by otters as a resting site. Where such sites are under gorse or other thick cover they may be used as breeding holts. (Photo: R.Strachan)

4.4 Conwy – Hydrometric Area 66A

General Description

The Conwy hydrometric area includes the main Afon Conwy, with its tributaries having their sources in the Snowdonia mountains to the south-west of the area, and the Afon Dulas, which lies to the east of Colwyn Bay and is generally a low lying catchment.

The majority of the lower Afon Conwy tributaries, the Crafnant, Ddu, Dulyn and Porth-llwyd, are short rivers rising in the northern Carneddau Mountains. The upper Afon Conwy and its tributaries, the Llugwy, Lledr, Machno and Merddwr, are much longer rivers within glacial valleys. All, however, have steep, rocky sections with waterfalls and rapids and gentler gravelly sections and several have their natural flow regimes affected by dams. Sheep pasture dominates land use in the valley bottoms and Gwydyr forest is an extensive area of conifers, surrounding Bettws-y-Coed. Acidification is a pressure in upland parts of the Conwy, including Llyn Conwy. Ways to mitigate acidification issues to meet the target dates are being investigated through the Water Framework Directive (WFD). Changes in forestry policy in Wales will reduce the impact of conifer afforestation on these river systems in the long term, with future establishment of unplanted riparian zones within forestry plans.

Tourists are attracted to the area for sight-seeing, walking, climbing and fishing and these outdoor activities are a particularly important part of the rural economy in this hydrometric area. Colwyn Bay, Llandudno and Conwy form a substantial urban area at the coastal fringe and provide a tourist destination in their own right, as well as a gateway to the Snowdonia massif to the west. Other industries include hydro-electric power generation, the largest scheme being on the Conwy at Dolgarrog, along with a proliferation of micro hydro-electric power schemes in recent years.

The Conwy meets good ecological status overall under the various measures for WFD. Water quality in the Dulas, which has suffered from agricultural pollution problems in the past, is also now showing good ecological status.

Flooding at Llanrwst and Trefriw in the mid-2000s has led to an extensive Flood Alleviation Scheme on this part of the Conwy. As part of this scheme mitigation measures for otters have included artificial holts and the planting of bankside cover.

Due to the physical nature of the catchments, fish populations are dominated by salmonids with eels and lamprey as other migratory species. Any coarse fish are generally limited to stocked still-waters.

OTTER SURVEY OF WALES 2009 - 10

Results of 2009-10 Survey and comparison with previous surveys.

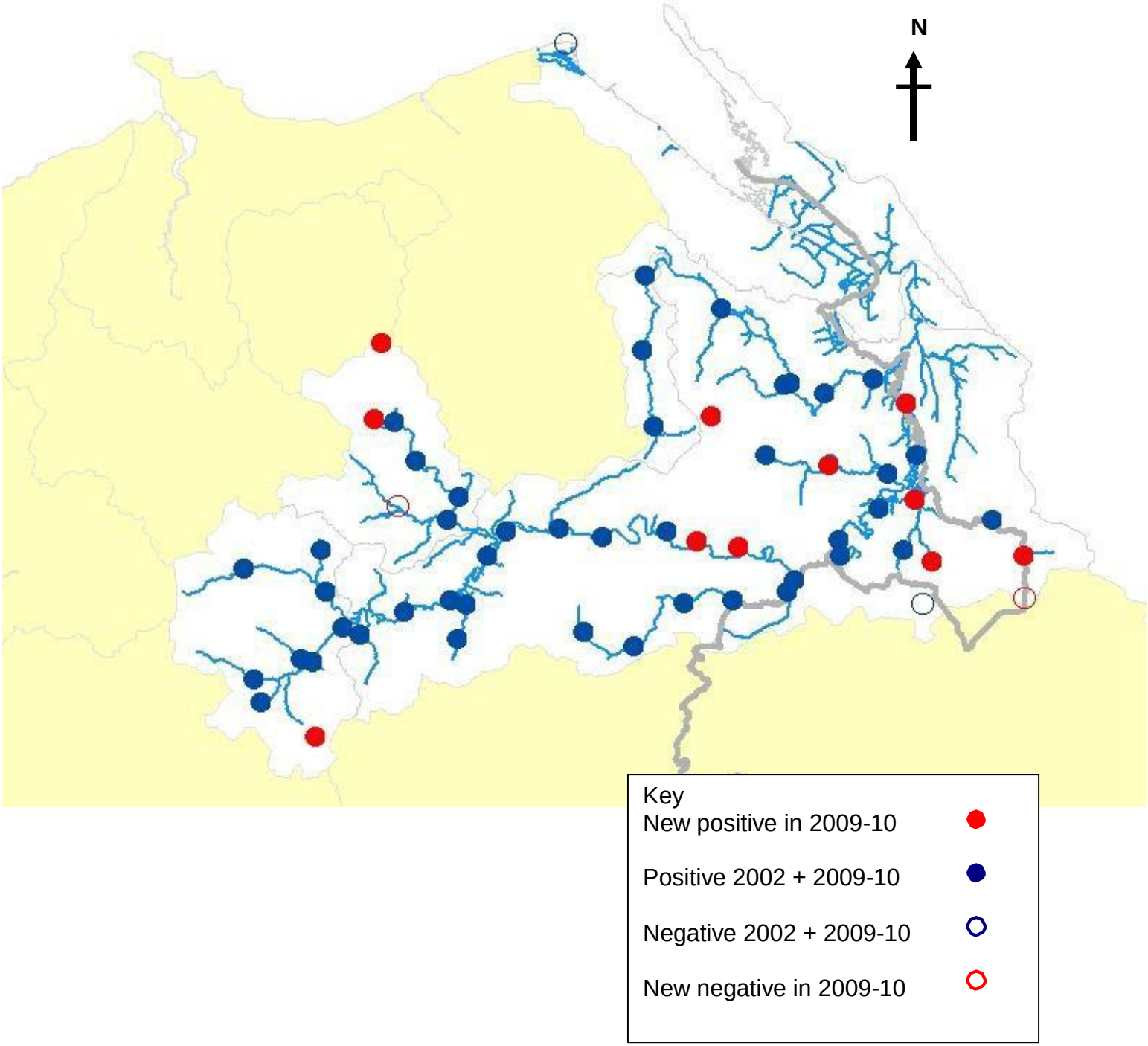
	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	1/32	7/36	12/36	28/36	34/36
% Positive	3%	19%	33%	78%	94%

Discussion

The increase in the number of positive sites, from 78% in 2002 to 94% in 2009-10, shows a sustained consolidation of range in the catchment. Comparing the latest results with those of 1977/8 gives an increase of 2900%, the largest expansion of all hydrometric areas over that time frame. While expansion has taken place throughout the area, it has been largely located along some of the minor tributaries, reflecting a consolidation of range and exploration of the entire catchment. Only two sites remained negative at the time of the survey. However, as all adjacent sites were positive, this may reflect the inclement weather conditions at the time obscuring or removing otter signs, rather than genuine absence.

The RSPB Conwy bird reserve overlooks pools and reed bed adjacent to the Conwy estuary. Since 2005 there have been an increasing number of otter sightings on the reserve (from single animals to family groups) reflecting their recent consolidation in range and probable regular breeding within the lower part of then catchment (RSPB pers. com).

4.5 Dee – Hydrometric Area 67



4.5 Dee – Hydrometric Area 67

General 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 and Wrexham. The catchment area of the freshwater Dee is covered by five local Welsh government areas, Gwynedd, Conwy, Denbighshire, Wrexham and Snowdonia National Park Authority, while the tidal Dee lies under the administration of Cheshire and Flintshire.

The major tributaries are the Tryweryn, Alwen and Ceiriog. The River Clywedog, which drains the Wrexham area, is also included in this catchment. 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 this catchment. These include Llyn Celyn, Brenig Reservoir and Llyn Tegid, as well as Alwen Reservoir which provides a direct water supply. Agriculture is the main industry, with sheep and beef farming dominant. There are some forestry plantations in the uplands.

Diffuse inputs, such as sediments from both agriculture and forestry, can affect the biological quality in parts of the catchment, and some of the lakes are subject to nutrient pressure. Some tributaries in the upper catchment are impacted by acidification or elevated metals, while others have had ecological impacts from pesticides in recent years, but have largely recovered now. Lower down the catchment there is more urban development, with increased population and industrial development around Wrexham, for example at Wrexham industrial estate. Urban pressures impact biological quality in the Gwenfro, which flows through Wrexham. There are elevated zinc levels in the Clywedog from Minera mine in the headwaters.

The Middle Dee includes the remainder of the main River Dee from the Ceiriog down to the canalised section below Chester. Major tributaries are the river Alyn, Worthenbury Brook and Aldford brook. The main centres of population are at Chester, Mold and Whitchurch.

The largest proportion of the Middle Dee lies in Wrexham, Cheshire West and Chester, before flowing into Flintshire and the Dee Estuary.

Where the Dee meanders through the Cheshire Plains, the landscape is dominated by dairy and arable farming. Mixed sheep and beef remain in the upper parts of the River Alyn on the edge of the Clwydian Hills. Larger manufacturing industries and the retail sector also play a key role in the economy of this area. Major drinking water abstractions are taken from

this section of the Dee. Coarse fishing is popular in the main river and some of its tributaries, and brown trout fishing is enjoyed on the River Alyn.
Where the Dee meanders it is designated for its fluvial geomorphological interest and consists of some of the most spectacular and intricately developed river bends or meanders seen anywhere in Britain.
The biological and ecological quality of the middle and lower Dee is under more pressure than the Upper Dee. These pressures include diffuse urban and diffuse rural pollution, as well as nutrient pressure from point sources such as sewage works. Physical modification also affects the rivers, with many of the brooks modified in their lower sections for flood alleviation. There are also some notable man made obstructions to fish migration, particularly on the River Alyn. The tidal reaches of the lower Dee are highly modified and constrained by artificial canalisation.

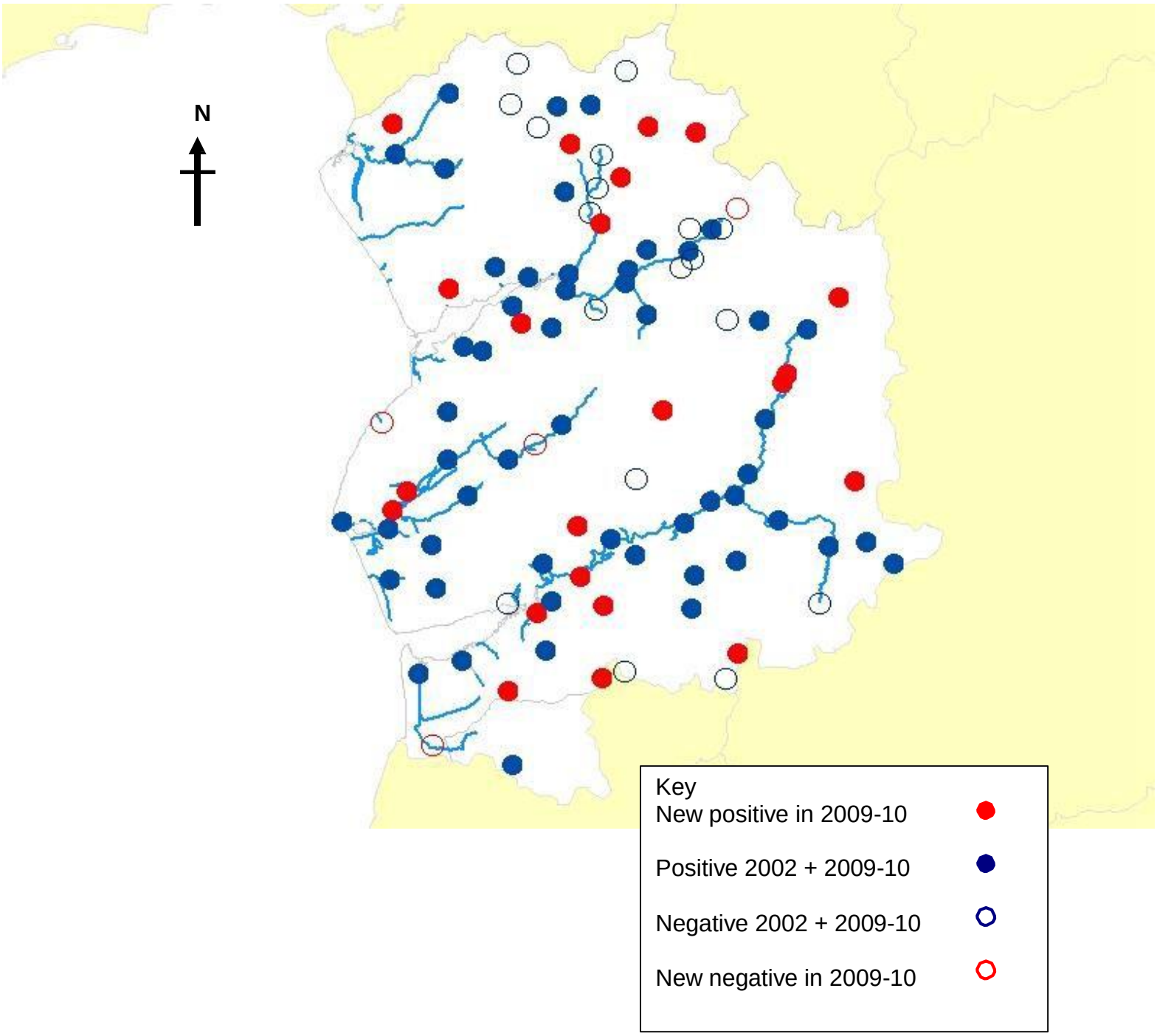
The River Dee and Llyn Tegid are designated as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) under the Habitats Directive, with the otter as a feature of interest. The Dee estuary is designated as a Special Protection Area (SPA) and SAC.

Results of 2009-10 Survey and Comparison with previous surveys.

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

Discussion
The percentage of positive sites increased from 78% in 2002 to 93% in 2009-10. Comparison of the common sites in all previously surveyed gives 94% of sites positive (see table 2).
New positive sites were generally scattered but most were along the upper tributaries and on the upper reaches of the Dee itself. Negatives sites occurred on the Shropshire Union Canal, some minor tributaries and at the point of Ayr (within the Dee estuary). This last location had been found positive in 2008 (R. Strachan *pers.obs.*) but it may have been a transient animal at that time.
A total of 12 sites in the Dee catchment were surveyed as part of the Otter Survey of England 2009-10 (Crawford 2010) and 8 of these were positive. Combining the Wales and England results gives 63 positive sites from 71, which is 89% for the whole catchment. Cheshire was identified as a key area for otters in the Otter Survey of England 2009-10 (Crawford, 2010) and some additional conservation effort should be focused on the lower Dee to assist in the continued colonisation of Cheshire and its wetlands.

4.6 Dyfi – Hydrometric Area 64



4.6 Dyfi – Hydrometric Area 64

General Description

The Dyfi Hydrometric area comprises the coastal river systems between Llanbebr, Gwynedd and Borth, North Ceredigion. The principal rivers are the Artro, and the Mawddach (including the Wnion, Aran and Eden) in the north, with the Dysynni and Broad Water and the Dyfi and its tributaries to the south. The Mawddach and Dyfi both have extensive estuaries, while the rivers themselves drain a substantial part of the Cambrian Mountains.

The principal population centres occur at the market towns of Machynlleth and Dolgellau, with smaller coastal towns at Barmouth, Tywyn and Borth. There is little industrial development, and tourism is a major industry for the area, especially during the summer.

Typically of West Wales, agriculture is dominated by sheep and cattle grazing, while extensive conifer plantations cover much of the upper Dyfi and Mawddach catchments. As a result, the area is vulnerable to acidification due to the base-poor geology and forestry run-off. Water chemistry sampling for the Water Framework Directive has recorded that both the Dyfi and Mawddach catchments continue to suffer from heavy metal and slate waste contamination from old mines and quarries. Traces of arsenic, zinc and other toxic heavy metals are present in the river gravels.

An important element of the local economy is the salmonid fishery, with some important runs of salmon and sea trout found in all the major rivers, though they are affected by poor water quality in some areas. Brown trout, minnow, lamprey and eel are also widespread, but coarse fish are limited. Broad Water also supports a specialist grey mullet fishery.

Through the Water Framework Directive, good progress has been made in recent years. This includes:

- easing barriers to fish migration
- tackling the causes of diffuse pollution
- tackling pollution derived from mine waste water,
- establishing large coarse woody debris as fish habitat,
- improving river habitats through creation of buffer strips within forestry and farmland

The Dyfi Estuary is recognised as globally important under the UNESCO designation of Biosphere Reserve. It is also designated as SAC, SPA and SSSI, with extensive areas are now managed for conservation by the RSPB, CCW and the Montgomeryshire Wildlife Trust. The coastal Pen Llyn a'r Sannau SAC and Afon Eden-Cors Goch Trawsfynydd SAC have the otter as a feature. Also adjacent to the Dyfi Estuary is the Cors Fochno SAC/SSSI which supports resident breeding otters.

Results of 2009-10 Survey and Comparison with previous surveys.

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

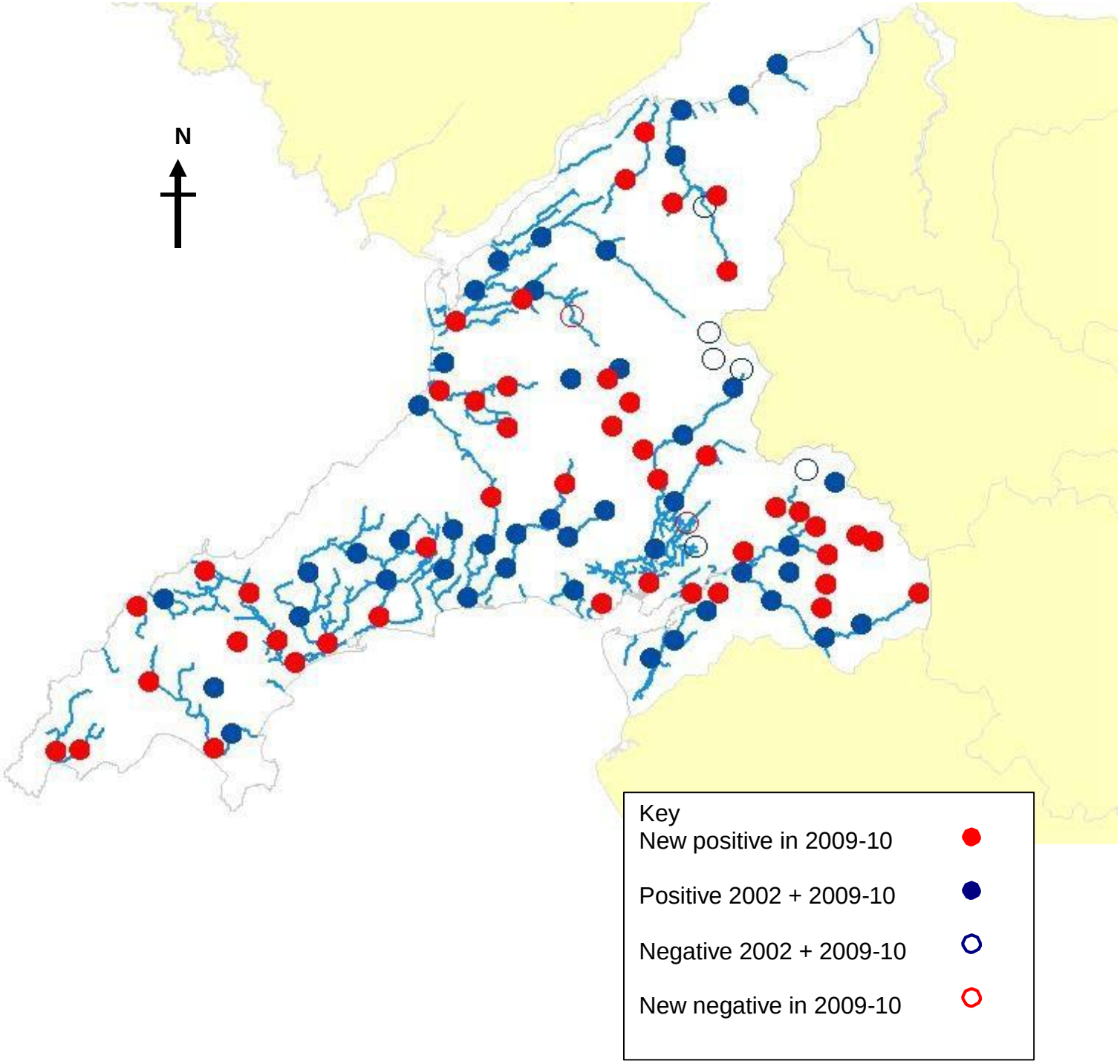
Discussion

The Mawddach, Dysynni and Dyfi all showed substantial improvements in positive results for otters in the 2009-10 survey compared to 2002. However, a total of 23 sites were found to be negative. This may reflect a poorer food supply in the upper reaches of the Dyfi and Mawddach catchments in their relatively unproductive environment. It may be that these catchments still suffer from an industrial past, when slate quarries and metal mines discharged contaminated waters. The presence of substantial areas of conifer forests in the catchments could also exacerbate the effects of acidification.

The survey of the area took place after a period of heavy rain and high river levels. In these conditions signs may have been washed away from some sites, so the results may represent an underestimate of the real situation.

Otter at Tal y Llyn lake. (Photo: I. Rhys)

4.7 Glaslyn – Hydrometric Area 65



4.7 Glaslyn – Hydrometric Area 65

General Description

The Glaslyn Hydrometric area in North Wales embraces a varied landscape. The rolling hills and low lying land of the Lleyn peninsula jut out westward into the Irish Sea. The area also extends up through the Menai Straits and inland to the steep rocky slopes of the Snowdonia mountains. The majority of rivers are short, especially on the Lleyn peninsula, and it is likely that otters will regularly travel between them. It is only the Glaslyn and Dwyryd river catchments that can be described as extensive.

The largest population base is Bangor, with smaller centres at Caernarfon, Porthmadog, Trefor, Criccieth and Harlech. Tourism is economically very important, with the all year attractions of Snowdonia and the summer attractions of the Lleyn peninsula and the Cardigan Bay coastline. There are many EC designated bathing waters and opportunities for water based recreation, including angling, sailing and canoeing.

The dominant agricultural activity is sheep production with some cattle grazing at lower levels, especially the more fertile areas of the Lleyn peninsula that are important for dairy farming.

The Water Framework Directive recognises that most of the water bodies in the Glaslyn hydrometric area are generally reaching good ecological status. However there are some localised problems with fish migration, poor productivity and diffuse pollution. Examples include quarry discharges on the Dwyryd and heavy metal pollution on the upper reaches of the Glaslyn. The area is also sensitive to acidification from air pollution, exacerbated by extensive conifer afforestation in upland areas. Future Forest Design planning will allow for the creation of buffer strips along watercourses within the plantations. The move towards re-planting conifers with broadleaved trees such as oak will also go some way towards ameliorating the situation in the long term.

Fish species present include salmon, sea trout, trout, eel and lamprey, with few coarse fish except where they have been introduced into stillwaters. The coastal part of the catchment however, supports a year round abundance of marine fish, from whiting, pollack and wrasse, to sea bass, sea bream, eelpout, blennies, mullet, sea sticklebacks and flounder. This is reflected in the otter diet as analysed by the Snowdonia Mammal Group (Strachan et.al 2006).

The Glaslyn and Dwyryd estuaries are nationally and internationally important for nature conservation, especially for wintering birds. The Gwyrfai and Llyn Cwellyn SAC and the Pen Llyn a'r Sarnau Marine SAC have the otter as a feature of interest.

Results of 2009-10 Survey and Comparison with previous surveys.

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

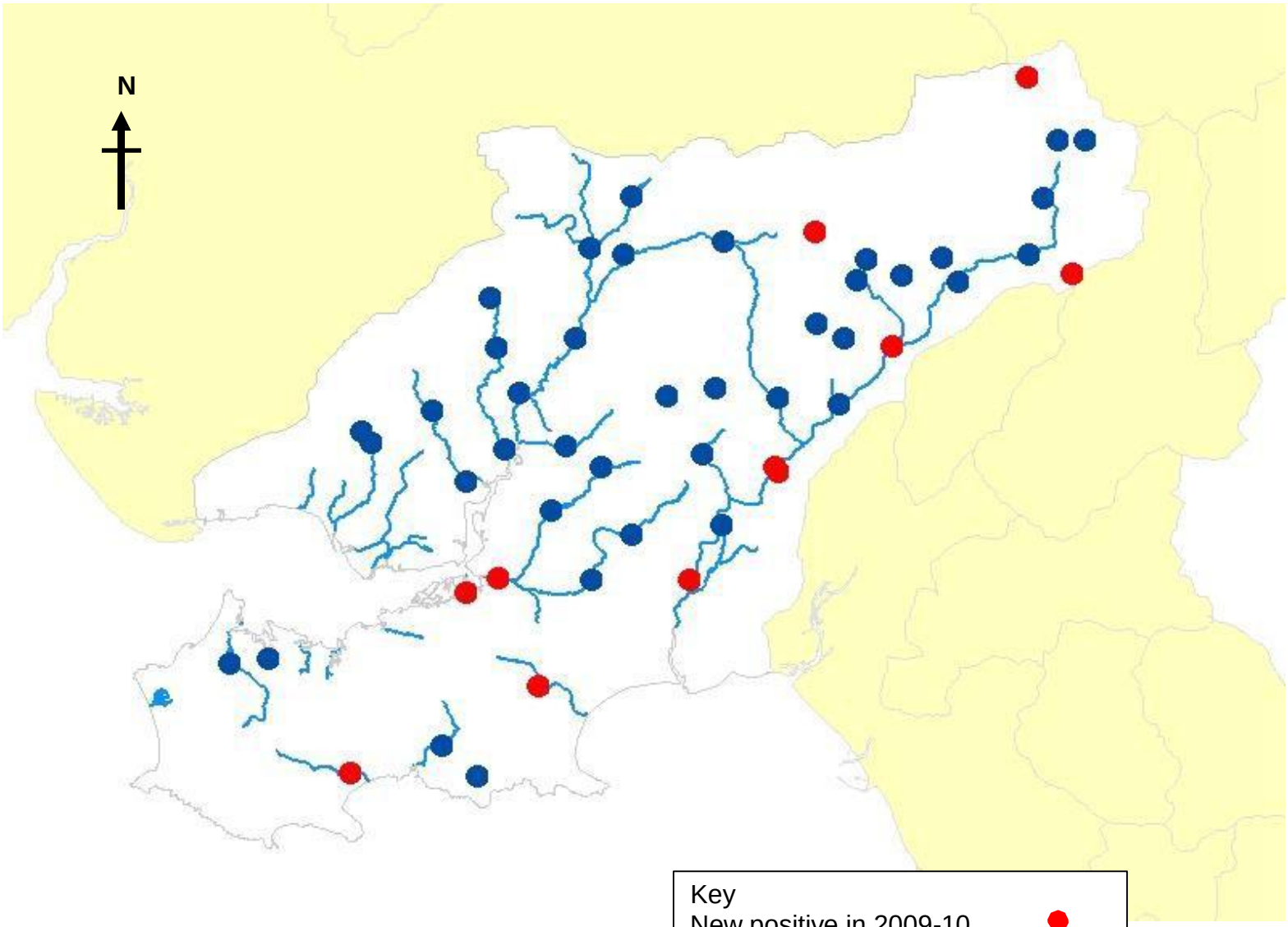
Discussion

The Glaslyn hydrometric area has been characterised by static results in the first three national surveys, showing virtually no change between 1977/8 and 1991. An increase from 48% in 2002 to 92% in 2009-10 is therefore quite significant. These increases represent a real expansion in range into the upper catchments of the larger watercourses and many of the upland lakes of western Snowdonia. This confirms the results of the Snowdonia Mammal Group's survey on the use of upland lakes in the area (Strachan *et al* 2006). Major expansion in distribution was evident on the Lleyn peninsula. Of the 33 sites in this area, only 1 was positive in 1991, 17 positive in 2002, and all 33 positive in the present survey. Unfortunately this is also reflected in the increasing number of otter road deaths in the area.

Expansion along the Lleyn peninsula and coastal Snowdonia has been made possible due to the sheltered bays and estuaries that have been exploited by otters for foraging and breeding. A recent investigation of how many otters are using this part of coastal Wales, as determined by genotyped DNA extraction from fresh spraints, has revealed distinct clusters of individuals associated with the river mouths and estuaries (MISE in prep.). One interpretation of this is that more than one breeding female is visiting these sites with cubs. It is known that juvenile otters may learn their hunting skills on slow moving prey such as shore crabs (Kruuk, 1995, Watt 1995) and this is reflected in the large number of spraints showing crab shell in them at these coastal sites.

Otter spraint with crab shell and fish scales (Photo: R. Strachan)

4.8 Loughor – Hydrometric Area 59



4.8 Loughor – Hydrometric Area 59

General Description

The Loughor hydrometric area is made up of three distinct areas. To the west the Loughor itself and the Llan, to the south the Gower peninsula and to the east the Tawe. The Loughour and the Tawe rivers both rise in the Black Mountains to flow in a south westerly direction to join the Bristol Channel either side of the Gower peninsula. The northern side of the Gower is noted for its large expanse of saltmarsh. This is very different coastal habitat to the southern side, which is largely dominated by sheer cliffs and beaches.

Urban development in the Tawe valley is concentrated in the south, with Swansea historically an important industrial centre and port, particularly linked to heavy industry such as metal refining. Today, light industrial and retail development now dominates along the Tawe river corridor. Elsewhere, there are major developed areas at Llanelli, Pontardulais and Ammanford.

Previous industrial activity in this hydrometric area has left a legacy of contaminated land, particularly around Llanelli. There are still a number of waste ground sites associated with the deep and opencast coal fields in the area.

Farmed land is typically dominated by dairy units in the west and mixed beef, dairy and sheep rearing in the east and upland areas. The Gower has significant areas of arable production.

Both the Loughor and the Tawe support locally important migratory salmonid fisheries. Brown trout are widespread, and coarse fish species such as carp, tench, perch, roach and pike are found both in natural and artificial stillwaters. A wide variety of marine fish are available in the estuaries and around the Gower.

The Tawe is impounded by the Tawe barrage below its tidal limit, and represents an artificial barrier to fish migration along with other structures prevalent in this area. Mitigation work to remove these barriers will be an important factor in improving fish passage and fish status under the Water Framework Directive. Rural land management, point source pollution, urban diffuse pollution, sedimentation and acidification all need to be addressed to further improve water quality, biology and fish status.

Results of 2009-10 Survey and Comparison with previous surveys.

	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	0/47	0/50	22/50	39/50	50/50
% Positive	0%	0%	44%	78%	100%

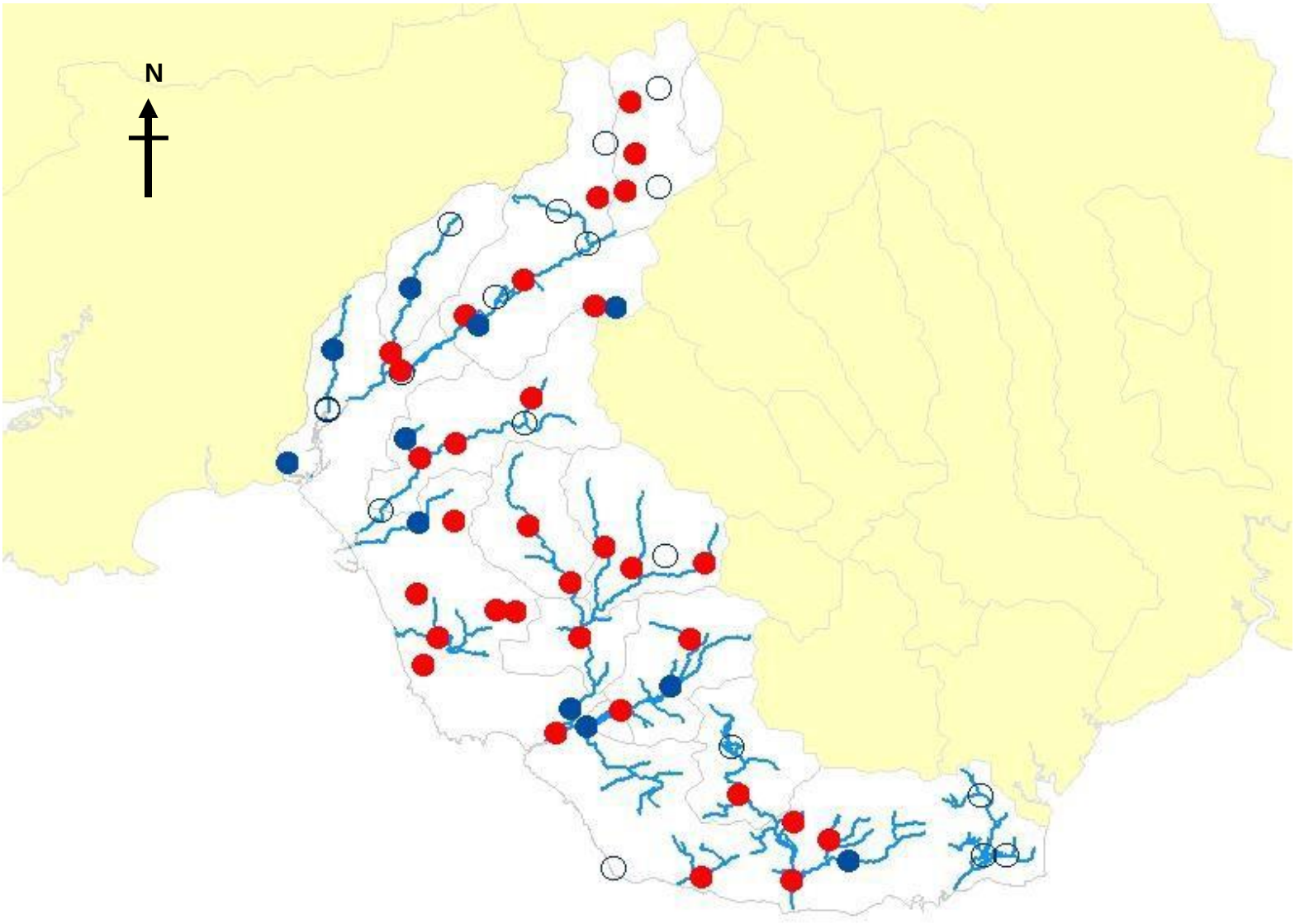
Discussion

In the 1977/8 and 1984 surveys all sites in this hydrometric area were negative. A major increase was evident in 1991 with 44% of sites positive. A further 17 positive sites were found in 2002 (78%), nevertheless full occupancy of sites in the current survey is still a remarkable recovery.

The greatest increases were associated with the upper reaches of the Tawe and tributaries such as the Twrch and Lower Clydach, where all the previously negative sites became positive. Smaller rivers flowing into the estuary near Llanelli now show positive evidence, despite being in an area with considerable human disturbance. Other gains were noted around the Gower, suggesting that otters were frequently using coastal waters.
The report on the third National survey for otters in Wales (Andrews *et al* 1993) suggests that the simultaneous return of otters to both the Tawe and the Loughor might have been the result of migration from the adjacent Usk and Tywi catchments. These catchments already had good populations at that time. Since then the species has consolidated its range with further expansion through coastal movements around the Gower peninsula.

Trail camera self-portrait on the lower Loughor (Photo: A. Harrington)

4.9 Mid Glamorgan – Hydrometric Area 58



4.9 Mid Glamorgan – Hydrometric Area 58

General Description

The Neath, Afan, Kenfig, Ogmore, Ewenny, Thaw and Cadoxton are the main rivers in this area. The River Neath and its tributaries rise in the Brecon Beacons and flow through steep sided, relatively undeveloped, wooded valleys in their upper reaches and a broad floodplain downstream. The Afan, Kenfig and Ogmore rise in the smaller hills associated with the South Wales coalfield. They are more typical "South Wales Valleys" rivers, incorporating steep valley sides frequently covered in conifer plantations with urban and industrial ribbon development along the valley floors. They have a flashy flow regime and, due to the underlying geology, there is little water storage or base flow, so in very dry summers some smaller tributaries can dry up. Most abstraction is for public water supply and commercial and industrial use.

The Thaw and Cadoxton rivers lie in the Vale of Glamorgan and are small lowland rivers. Many of the river catchments have recovered from historical degradation caused by iron, coal and other industries and their run-off to the rivers. Historical industrial development and towns tend to lie close to the banks of the rivers, resulting in extensive physical modification and loss of riparian habitats.

The lower and coastal reaches of the Neath, Afan, Ogmore and Cadoxton are densely populated and industrialised. The major towns in this area include Neath, Port Talbot, Bridgend and Barry. The upper reaches of the Neath, Afan and much of the Ogmore are moorland, with some extensive coniferous plantations. The Ewenny and Thaw are almost entirely in productive pastoral and arable farmland.

Water quality is mostly good, but many rivers are vulnerable to pollution incidents, mainly due to the industrial nature of the catchments. Polluted water from abandoned mines is still a problem in some areas, particularly on tributaries of the Neath, Afan, Kenfig and Ogmore. In more rural areas, diffuse pollution from agriculture is of general concern. All these catchments suffer from invasive non-native plants such as Himalyan Balsam and Japanese Knotweed. These plants can form extensive areas along watercourses, leading to loss of native plants and soil erosion in winter.

Migratory salmonids and brown trout dominate the river systems. Populations have steadily improved over the past few years through proactive measures to enhance riverine habitat and improve water quality. Demand for angling is substantial in this urban area, and there are a number of artificial stillwaters stocked with coarse fish and rainbow trout.

Results of 2009-10 Survey and Comparison with previous surveys.

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

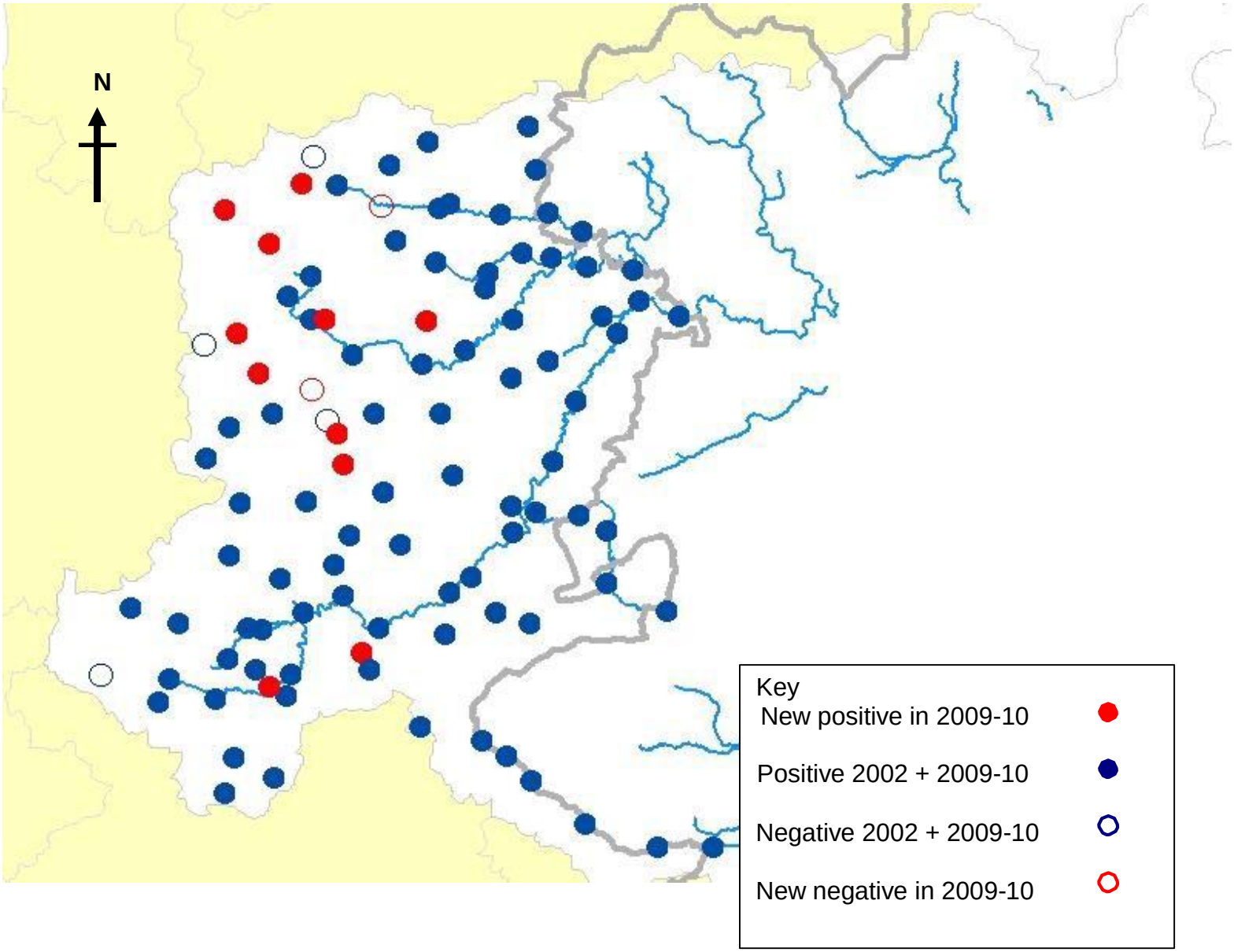
Discussion

Together with Anglesey, Mid Glamorgan had the lowest proportion of positive sites in the 2002 survey with 18%. However like Anglesey, the hydrometric area has made a dramatic recovery, with 43 of the 61 survey sites (70.5%) positive for otters. This represents a percentage increase between 2002 and 2009-10 of 292%, the highest of the whole survey.

Signs were evident on all the major catchments, i.e. the Neath, Afan, Ogmore and Thaw, but only at a small number of sites. This suggests a consolidation of range and likely breeding. The Cadoxton River and Sully Brook above Barry were still negative, despite some good habitat. Another cluster of negatives was located across the uppermost reaches of the Neath catchment.

Otters are now regularly seen at Kenfig pool, even during daylight hours.
(Photo: R. Parry)

4.10 Severn – Hydrometric Area 54



OTTER SURVEY OF WALES 2009 - 10

General Description

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 and is currently subject to restoration works.

The tributaries support a diverse range of ecology associated with good water quality. However, the headwaters of many streams along the western uplands are impacted by acid run-off or drainage from abandoned metal mines. Sheep dip and sediment run-off cause ecological impacts in several rivers such as the Tanat, Vyrnwy and Cain.

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 have been identified by the Severn Rivers Trust to be targeted for fish passes. Grayling, bullhead, and stone loach are also common in the upper reaches and are complemented by dace and chub populations downstream of Llanidloes to the Shropshire border.

There are 93 river water bodies and 4 lakes in the catchment as recognised by the Water Framework Directive. 45% of the rivers currently achieve good ecological status. 52% of rivers assessed for biology are at least good biological status now. Local actions will address key pressures such as diffuse pollution in the catchment. It is expected that 20% of surface waters in the Severn Uplands catchment will improve for at least one ecological element of good status. In-stream fish habitat creation, sensitive bank restoration work, tree planting and bank fencing are also being carried out by organisations such as the Severn Rivers Trust to improve the ecological status of the rivers.

Results of 2009-10 Survey and Comparison with previous surveys.

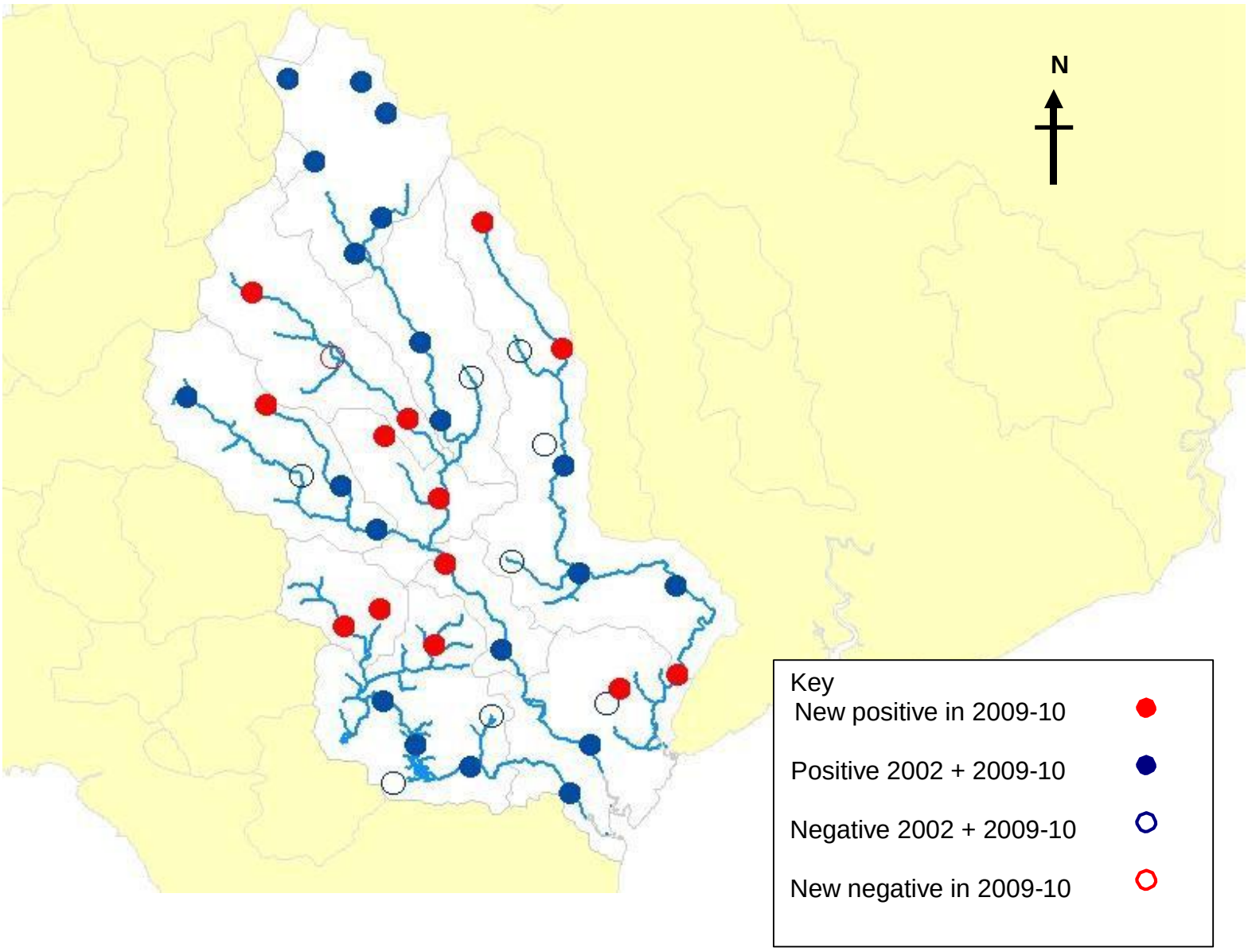
	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	40/101	68/101	75/101	87/101	95/101
% Positive	40%	67%	74%	86%	94%

Discussion

The Welsh part of the Severn hydrometric area has shown a continued expansion of occupied sites, as the population has consolidated its range and utilised many of the upper tributaries and lakes. Only six sites were negative out of the 101 surveyed again among the uppermost tributaries. The Teme, which rises in this hydrometric area but joins the Severn at Worcester, maintained all its positive sites. The part of the Severn catchment that lies in England was reported by Crawford (2010). Of the 328 sites in the English survey, 194 (59%) were positive. Combining the results for the entire catchment gives a total of 289 positive sites from 429, equating to 67%. It is likely that this population of otters, together with those from the Wye, have helped drive the recovery of otters into the English midlands.

This hollow ash tree on banks of River Cain provides an otter resting site along this upper Severn tributary. Spraint was located within the hollow. (Photo:R. Strachan)

4.11 Taff – Hydrometric Area 57



4.11 Taff – Hydrometric Area 57

General Description

The Taff Hydrometric area comprises three main river systems, known collectively as 'Valleys' rivers. These are the Taff, Rhymney and Ely. The upper Taff rises in the mountains of the Brecon Beacons, while the Rhymney and the Rhondda, rise on the northern edge of the South Wales coalfield, the source of the Ely. All these rivers flow in a southerly direction to converge around Cardiff, with the Taff and Ely rivers entering Cardiff Bay impoundment and the Rhymney entering the Bristol Channel to the east of Cardiff.
The urban population is centred on the large towns of Merthyr Tydfil, Caerphilly, Ebbw Vale and Cardiff city.
The 'Valleys' rivers are typically steep sided, with mountainous upper valleys and extensively urbanised valley floors opening out into meandering lowland river valleys. They have a flashy flow regime and due to the underlying geology there is little water storage or base flow. In very dry summers some smaller tributaries can dry up. Most abstraction is for public water supply, with reservoirs on the upper catchment of the Taff, but there is also local abstraction for commercial and industrial use.
Many of the river catchments have recovered from historical degradation caused by iron, coal and other industries and their run-off to the rivers. Historical industrial development and towns tend to lie close to the banks of the rivers, resulting in extensive physical modification and loss of riparian habitats. Sheep farming and extensive conifer plantations dominate the uplands and hillsides. There is a mixed pastoral and arable farming on the floodplains of the lower Rhymney and Ely.

Improvements in water quality have allowed the return of salmon and sea trout, with some tributaries providing spawning and nursery areas. Overflows from abandoned mine workings can cause water quality problems, but they do benefit river flows in the summer months. Rivers are vulnerable to diffuse and intermittent point source pollution from urban and industrial development. There are major water supply reservoirs on the upper Taff, which also provide important recreational fisheries.

The impoundment of Cardiff Bay into a large freshwater lake has changed the nature of the lower reaches of the Taff and Ely. Despite this, otters are regularly seen within this impoundment and on the sea front at Penarth along the coast to the west of Cardiff (C.Owen pers com.).

Results of 2009-10 Survey and Comparison with previous surveys.

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

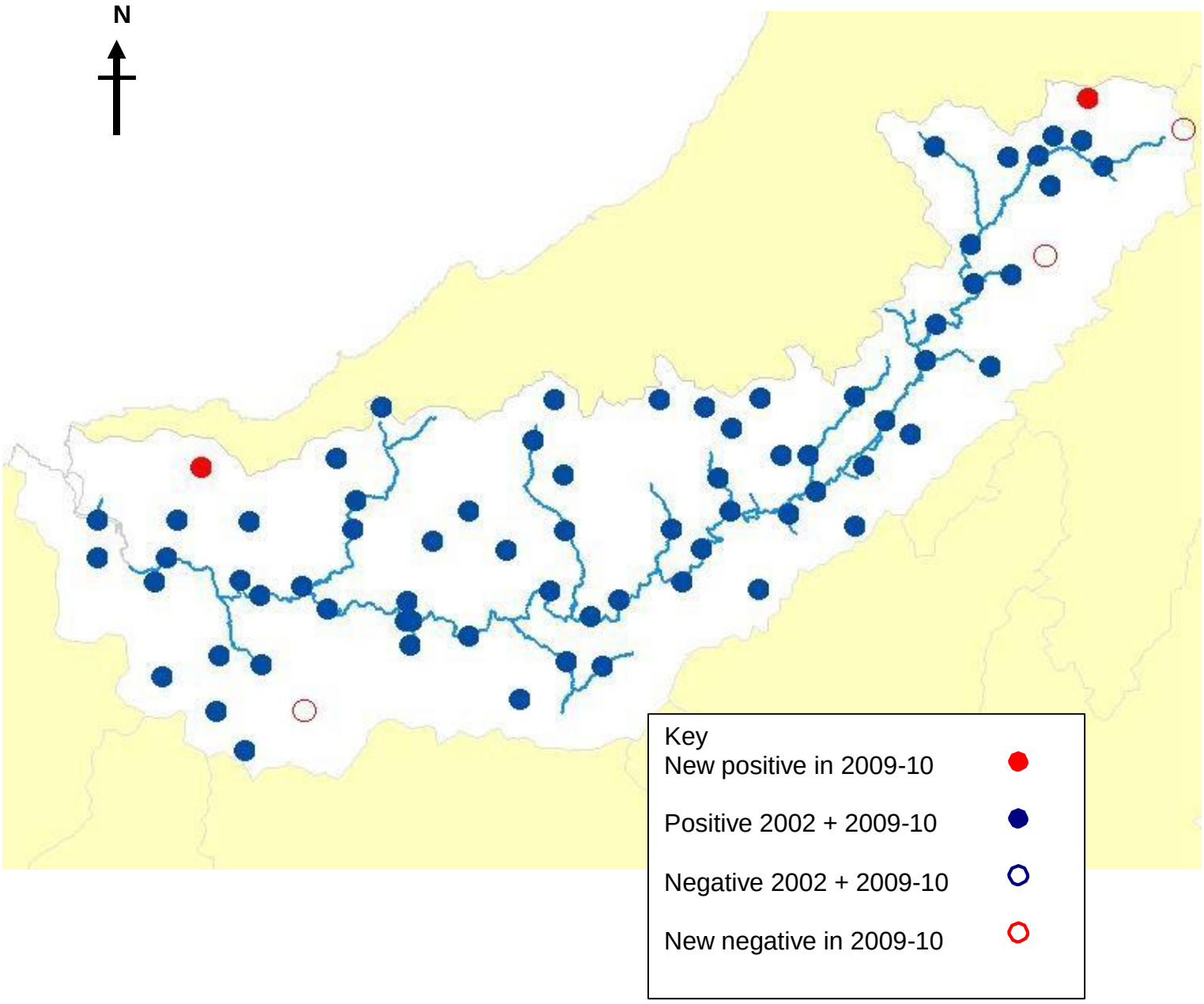
Discussion

The area shows a significant increase in the number of positive sites from 50% in 2002 to 79% in 2009-10. Otters evidently now use the entire length of the Taff, from Cardiff Bay to the excellent habitat provided by reservoirs in the upper reaches. There was also further consolidation of range across the Ely and Rhymney catchments reflecting a population expansion within the hydrometric area. The nine negative sites remain along the smaller tributaries and so are likely to be sporadically used by otters.

As the otter population has adapted to these urban watercourses there have been increasing numbers of sightings from within the City boundaries. These include females with small cubs in the River Taff by the Millennium stadium, suggesting local breeding. Better breeding habitat occurs along the lower Ely as extensive woodland cover occurs there.

Fresh spraint confirms the presence of otters in the headwaters of the Taff on the southern flanks of the Brecon Beacons (Photo: R. Strachan)

4.12 Teifi – Hydrometric Area 62



4.12 Teifi – Hydrometric Area 62

General Description

The Teifi hydrometric area consists of a single main river, the Teifi, one of the largest rivers in Western Wales into which many tributaries flow. Rising in the Cambrian Mountains, amongst the Teifi Pools, the River Teifi flows in a south westerly direction to Cardigan Bay. The river descends steeply from its source through moorland and forestry, before levelling out through Cors Caron National Nature Reserve (NNR), a large area of raised mire north of Tregaron. The open expanse of Cors Caron, with pools and scrub cover, probably never lost its population of otters that were present in the baseline survey of 1978. Downstream of Tregaron, the river runs a varied course, from areas of open agricultural land to steep-sided tree-lined gorges. Below Cilgerran gorge the river flows through the Teifi Marshes to the sea, another area that maintained a population of otters throughout the survey periods. Not surprisingly the Teifi, with many of its tributaries and Cors Caron, are designated as SSSI and SAC with otters cited as a feature of interest.

Sheep farming dominates the upper reaches, giving way to mixed and dairy farming in the middle and lower areas. Tourism is a major industry throughout the area, with fly fishing recognised as a significant element of the local economy. This is because the Teifi is one of the most productive salmon and sewin (sea trout) fisheries in Wales. The upper reaches of the river also support good brown trout populations and grayling are found on the middle reaches. There are also a number of stillwaters within the catchment offering coarse fishing as they are stocked with carp, tench, roach and rudd.

The water quality is generally good in the middle and lower reaches of the catchment. However, the upper reaches of the Teifi are failing for fish under Water Framework Directive measures. This is due to a combination of base-poor geology and surface water acidification caused by extensive afforestation in the upper catchment, and a number of barriers that prevent fish migration. Both acidification and metal mine discharges are likely to have local impacts on aquatic invertebrate numbers in the upper reaches, with a knock-on effect on fish populations.

Sheep-dip pollution and sedimentation may also be the cause of poor invertebrate populations further downstream. In order to meet WFD objectives, rural land management, pollution from metal mines and acidification all need to be addressed, to further improve water quality, biology and fish status.

Results of 2009-10 Survey and Comparison with previous surveys.

	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	28/73	29/75	44/75	72/74*	71/74
% Positive	38%	39%	59%	97%	96%

*Field survey sheet for one site was not available for the 2002 and 2009 survey.

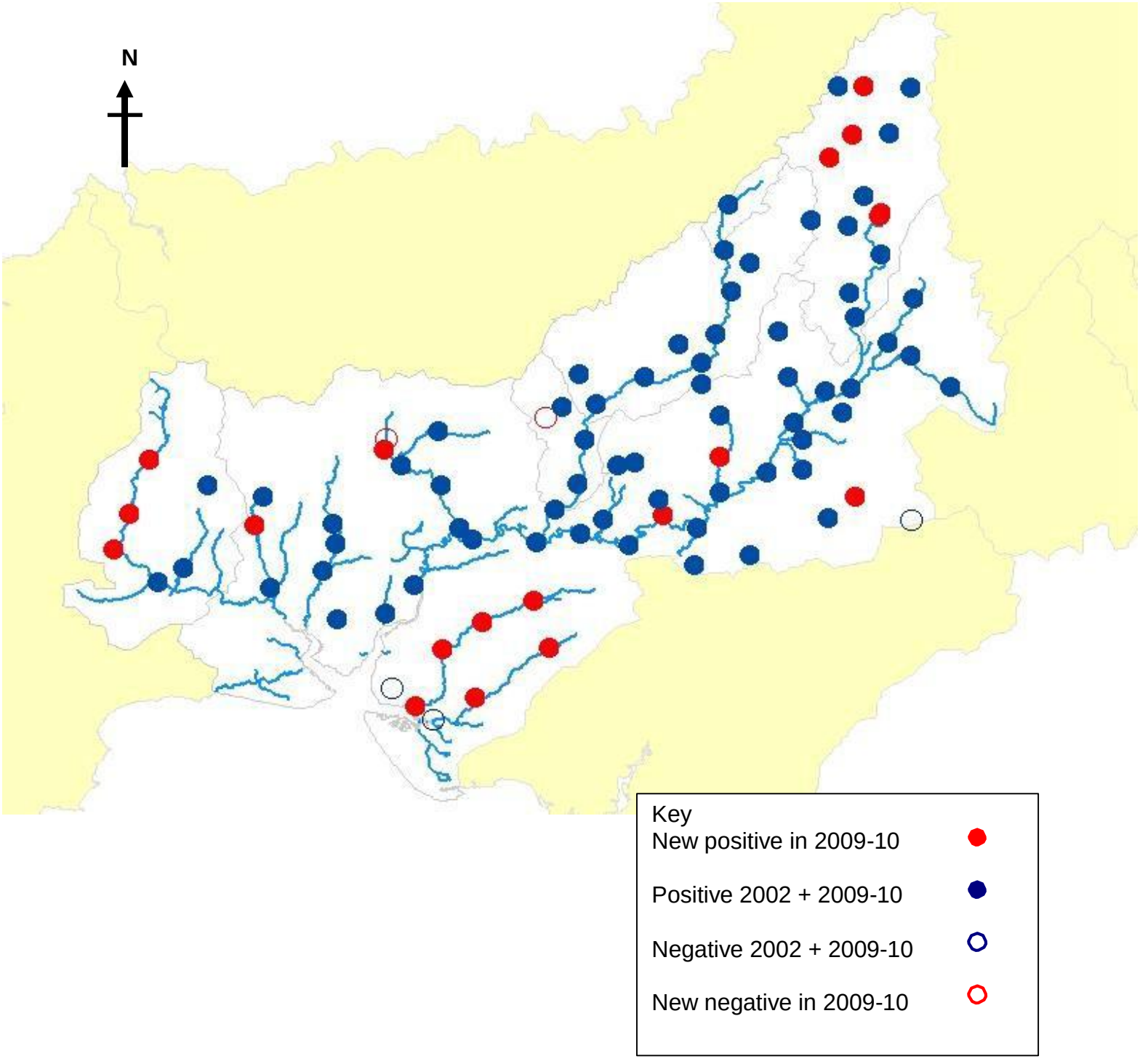
Discussion

The proportion of positive sites was 96%, one percent less than in the 2002 survey. However this is a statistically non-significant change and reflects the that the difference in the total of sites positive for the two surveys was a single site. In the present survey the only 3 negative sites were among the uppermost sites on minor tributaries that were all positive last time. The two previously negative sites, on the Arberth in the lower catchment and the Marchnant in the uppermost reaches, were now found to be positive. The entire catchment can, therefore, reasonably be said to be utilised by otters, with the species perhaps near to carrying capacity within the system. Surveys at a different time of year, and under better weather conditions, may have found all sites positive.

Assessment of the Teifi SAC has confirmed that the river has suitable resting and breeding sites along its length and that the whole site is meeting favourable conservation status for the species (Liles 2006).

River Teifi at Cors Caron NNR. Tracks of female otter with cubs on fine silt of river margin.(Photo: R. Strachan)

4.13 Tywi – Hydrometric Area 60



4.13 Tywi – Hydrometric Area 60

General Description

The rivers Tywi, Taf, Gwendraeth Fawr and the Gwendraeth Fach comprise the Tywi hydrometric area. Of these the Tywi itself is the largest river that rises in an upland moors and conifer plantations above Llyn Brianne Reservoir. The reservoir regulates the river flow as it descends through a steep wooded valley, before discharging to a long, wide, flat meandering floodplain towards Carmarthen Bay. The Taf and Gwendraeth also flow into Carmarthen Bay. The Taf rises in an area of lower hills and flows through undulating, agricultural land. The Gwendreath Fach and Fawr are smaller rivers, the former flowing through a predominantly rural farmed landscape, while the latter is more heavily urbanised with a history of industry.

As a largely rural area, the various population centres are fairly small, with Carmarthen being the largest town in the area and Llandeilo and Llandovery other centres of rural commerce.

The various water bodies of the Tywi catchment meet good ecological status under the Water Framework Directive. However there are concerns about diffuse pollution from agriculture and the effects of acidification on the Tywi in particular. Abandoned metal mines lead to localised impacts in the upper reaches of the Tywi and Taf. By contrast the Gwendraeth Fawr has numerous abandoned coal mine workings, many of which discharge acidic water containing high levels of iron. This is a priority issue to address under the Water Framework Directive. Some of the upper reaches of the watercourses are failing for fish under WFD measures, especially where artificial weirs have created barriers for upstream fish migration.

The various rivers hold significant populations of trout, sea trout and salmon, with the Tywi being recognised as one of the best sea trout angling rivers in the UK. Coarse fish are largely restricted to stillwaters, though pike are found in the lower Tywi and Cothi.

The main River Tywi downstream of Llandovery is designated as a SSSI and SAC with otters included as a feature of interest. The Carmarthen Bay and Estuaries SAC covers the lower end of all three rivers and the coastline. These tidal reaches also offer good recreational and commercial sea fishing, including licensed seine and coracle fisheries as well as shellfish beds. Investigations are currently underway to establish and resolve the issues surrounding the Burry Inlet cockle mortalities.

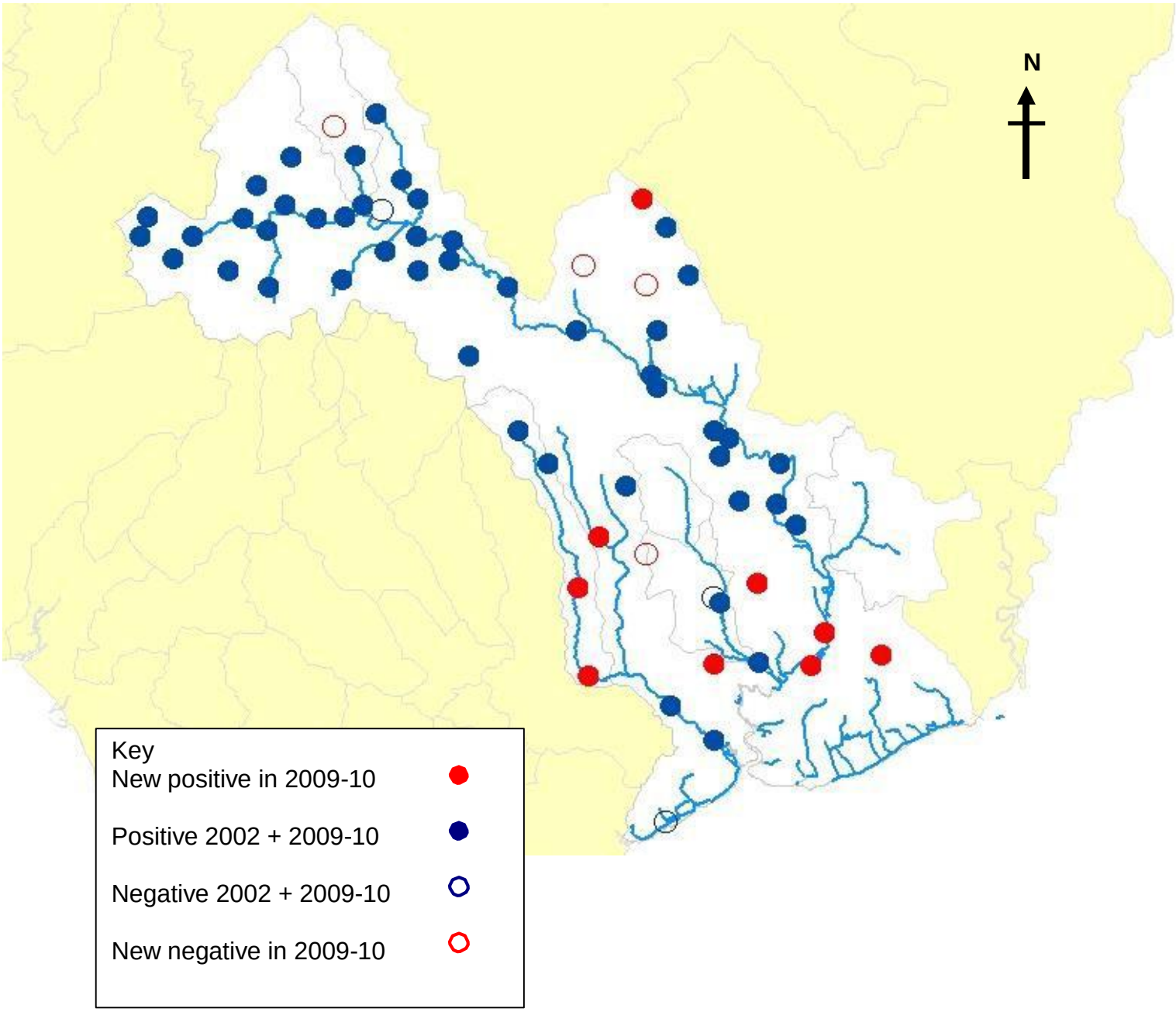
Results of 2009-10 Survey and Comparison with previous surveys.

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

Discussion:
The Tywi hydrometric area showed a continued improvement in the total number and proportion of positive sites from 2002 to 2009-10. It had an additional 17 positive sites, an increase from 76% to 94%.
New positive sites were located on the Sawdde, Gwendraeth Fawr, Gwendraeth Fach and on the Doethie, Pysgotwr and Camddwr in the upper reaches. Five sites remain negative on some of the smaller tributaries, consistent with an otter population close to carrying capacity.

Tidal flaps on the Gwendraeth Fawr may be a barrier to otters travelling the estuary that will force them to cross the busy A484 near Kidwelly (Photo: R. Strachan)

4.14 Usk – Hydrometric Area 56



4.134 Usk – Hydrometric Area 56

General Description

The Usk hydrometric area includes the Usk and Ebbw catchments as well as part of the Gwent Levels around Newport. The River Usk itself rises in the Carmarthen Fans, from which it flows briefly north to the Usk Reservoir, east to Brecon and then southward to Newport, before finally discharging into the Severn Estuary. It receives numerous, relatively short, tributaries along its length, the majority from the flanks of the Brecon Beacons or Black Mountains. The principal exception is the Olway Brook, which is a lowland sub-catchment through heavily farmed land that suffers from diffuse pollution. The Usk also has one tributary, the Lwyd, which flows from an urbanised and industrialised catchment, being heavily engineered and modified along its length. There are major reservoirs at Crai, Talybont, Llandegfedd and Wentwood that regulate water flow. The River Usk is designated a SSSI and SAC with the otter cited as a feature of interest.

The River Ebbw in the western part of the hydrometric area flows to the Usk Estuary to the west of Newport. The Monmouthshire & Brecon Canal is a major feature of the area that has recently celebrated its Bi-centenary since its construction. The canal connects Newport and Brecon and has a short side branch to the Ebbw valley. At present it is not navigable over its entire length, but restoration work is currently being undertaken to expand boat use into its lower reaches.

The area also includes the Gwent Levels SSSI, an extensive area of reclaimed coastal grasslands of major historical and nature conservation importance.

Over much of the Usk hydrometric area agriculture dominates the land use, with sheep grazing and forestry the major components in upland areas and beef and dairy farming in the lowlands. Diffuse pollution from agricultural and forestry run-off contributes to some tributaries failing under Water Framework Directive measures.

Historically many of the valley areas in the Ebbw catchment and the coastal area surrounding Newport were dominated by heavy industry. As a result, many of the watercourses are heavily modified waterbodies under WFD classification. Water quality, however, is generally good and in areas previously influenced by heavy industry there has been significant improvement over the past twenty years. Water Framework Directive investigations have highlighted some watercourses within this hydrometric area as failing. This is due to the impoundment of weirs that prevent the migration of salmonids to the upper catchments. In the lower reaches of some watercourses such as the Ebbw, the river is heavily engineered and would need large scale rehabilitation to restore it to a naturally meandering state.

The Usk has a significant fishery of migratory salmonids, though declines in catches have been reported in recent years, reflecting general declines across Welsh rivers. Habitat improvement work is currently underway through the partnership of EAW/NRW, the Wye & Usk Foundation and local landowners. The rare herring-like Twaite Shad also spawns on the Usk, with a number of weirs and bridge footings thought to be a barrier to upstream migration. In particular, the Trostrey and Rhadyr Weirs may be a barrier to

shad migration under low flow conditions. Some stillwaters, including various reservoirs, are stocked with trout or coarse fish. Historically, elver netting occurred on the tidal reaches. However there has been a significant decline in numbers caught, and there is national concern about eel populations across all of Wales. Around the Usk estuary and Gwent Levels a number of tidal flaps have been modified to allow access for eels. Special eel passes have been added to a number of weirs, including penstock tipping weirs across the Gwent Levels.

Results of 2009-10 Survey and Comparison with previous surveys.

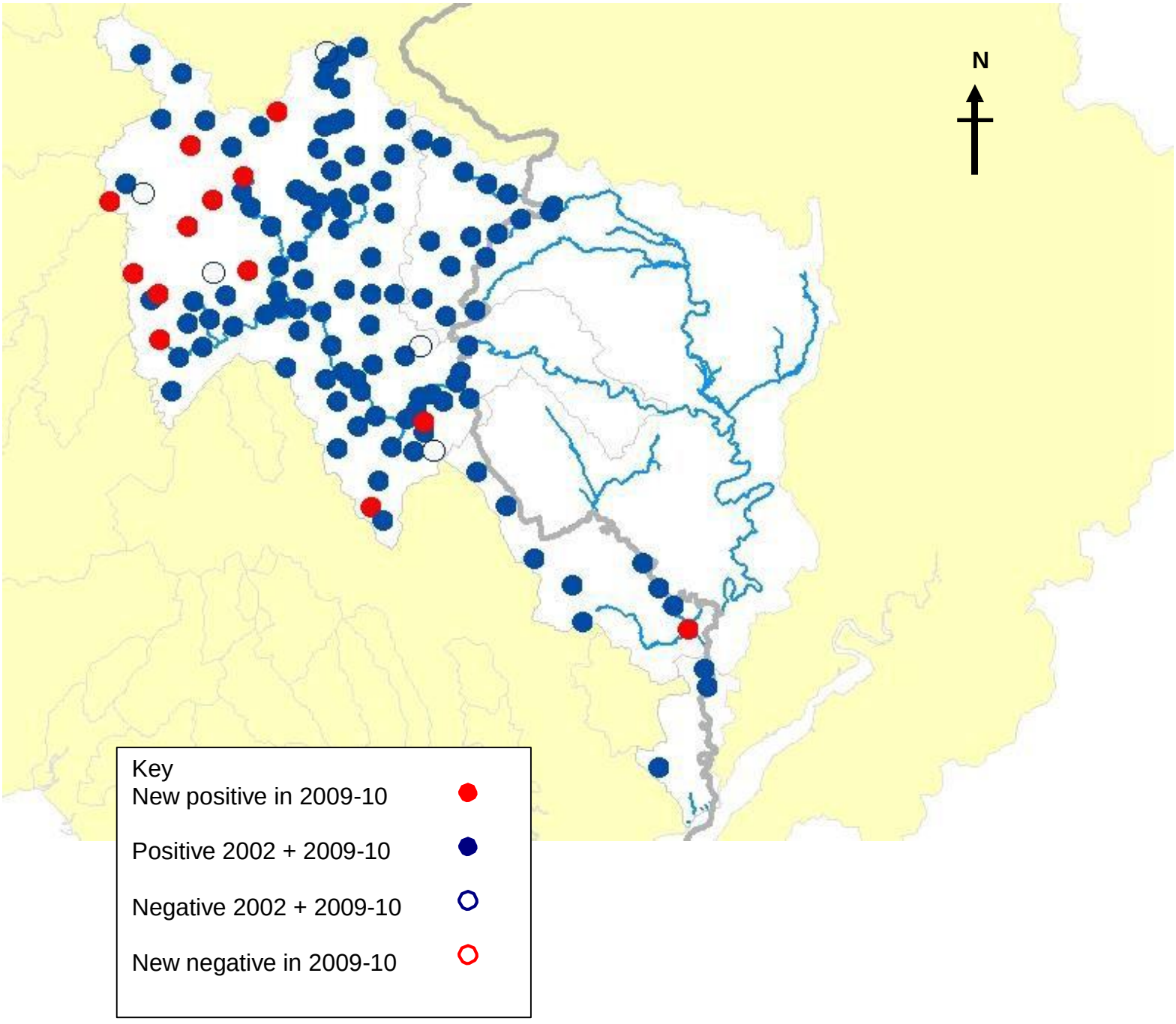
	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	6/56	18/62	34/62	48/60*	55/62
% Positive	11%	29%	55%	80%	89%

* 2 survey sites were not visited in 2002 but were surveyed in 2009-10

Discussion

There was an increase in the number of positive sites from 80% in 2002 to 89% in 2009-10. The new positives sites were concentrated on the industrial catchments of the Lwyd and Ebbw, and the lower reaches of the Usk, including the Monmouthshire & Brecon Canal. There were still, however, a number of negative sites scattered across these catchments where the otter may further consolidate its range in the future. As the species has extended its range from the main River Usk, it has allowed dispersing animals to colonise the Eastern Valleys rivers, industrial sites around Newport and the network of drainage ditches of the Gwent Levels.

4.15 Wye – Hydrometric Area 55



4.15 Wye – Hydrometric Area 55

General Description

Rising on the eastern slopes of Pumlumon in the Cambrian Mountains, the River Wye flows in a south-easterly direction through Llangurig, Rhayader, 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 Irfon is currently the focus of an EU Life+ project to deal with the joint threats of acidification and diffuse pollution, and address opportunities for habitat restoration. This project is being led by The Wye & Usk Foundation (WUF) in partnership with NRW, The National Museum of Wales and the Association of Rivers Trusts.

The River Trothy is another priority failing waterbody in the catchment, and this too is subject to farm-based project work. This work addresses issues of diffuse pollution in a partnership project led by the Gwent Wildlife Trust, in association with NRW and WUF.

The Wye catchment is rich in wildlife and habitats and this is recognised in the designation of the Wye and several tributaries as a riverine SSSI and Special Area of Conservation The 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 and the Wye and Lugg are unusual in that there is a public right of navigation. The River Wye is a well- established and nationally significant salmon and brown trout rod fishery. The Wye has been famous for its annual salmon runs. However these runs have declined significantly over the past few years, and much effort is being expended on the restoration of the fishery through organisations such as Environment Agency Wales (now NRW) and the Wye & Usk Foundation. Sea Lamprey, Allis Shad and Twaite Shad arrive to spawn above Monmouth and elver fishing also takes place within the tidal reaches of the Wye. Twaite Shad often spawn at or just above the tidal limit, but in the Wye they migrate over 100 km upstream, the highest spawning site being at Builth Wells. Elsewhere the Wye is also a locally important coarse fishery, and extensive fish stocks on the larger rivers include pike, chub, dace and roach. Some of the tributaries in the catchment have populations of native White-clawed Crayfish, though these have declined markedly in recent years, especially following introduction of the non-native American Signal Crayfish.

The Elan Valley system of reservoirs is vital in providing water for Birmingham, Gloucestershire and South Wales. The local economy is moderately dependent on businesses requiring water abstraction, primarily agriculture, where trickle and spray irrigation is frequently used.

Results of 2009-10 Survey and Comparison with previous surveys.

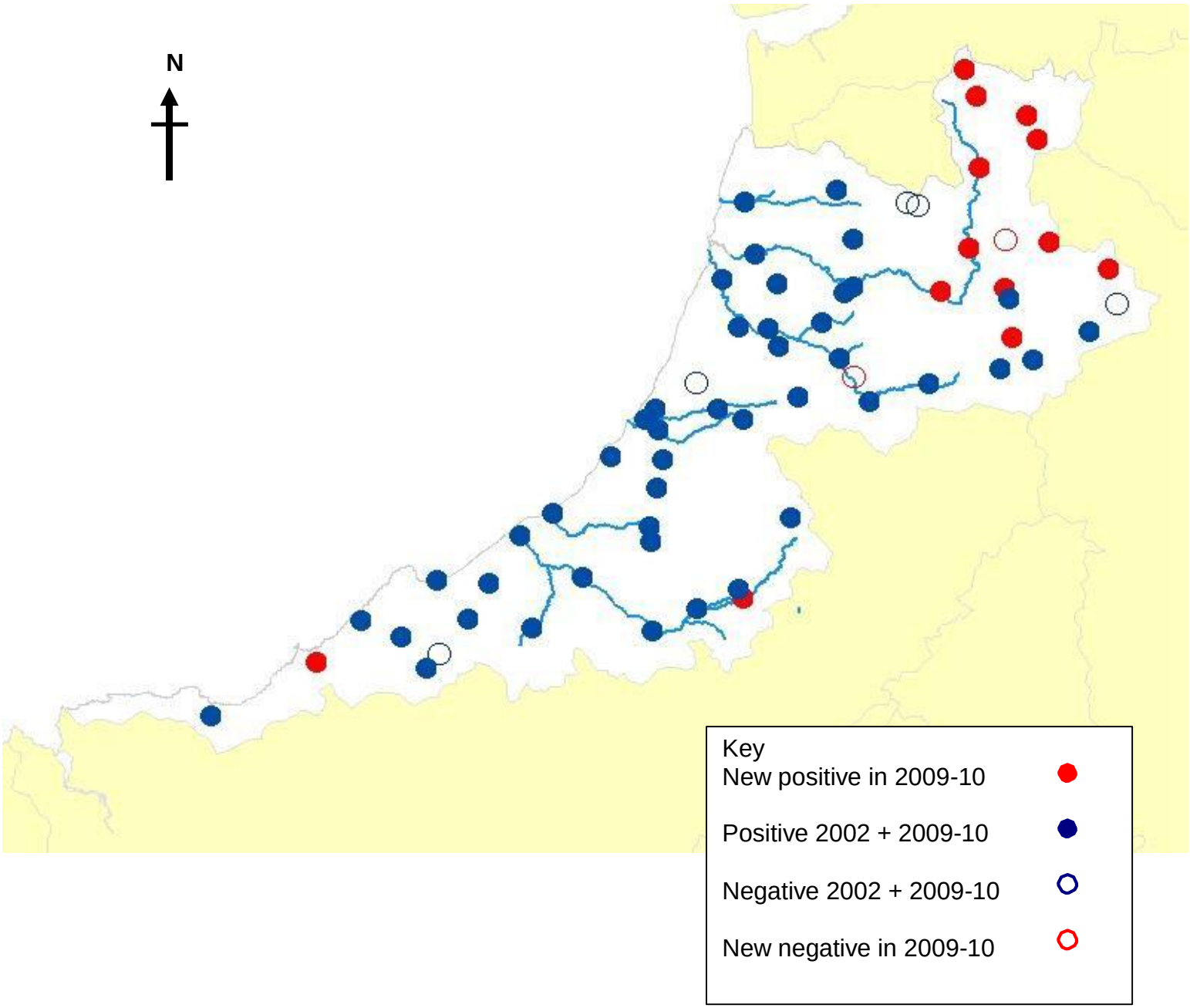
	1977-78	1984	1991	2002	2009-10
Positive sites (positive/total)	28/118	73/118	100/122	112/122	124/129
% Positive	24%	62%	82%	92%	96%

Discussion

The increase in the proportion of positive sites from 92% in 2002 to 99% in 2009/10, (97% if only sites common to all surveys are compared), indicates that the Wye within Wales is at or approaching carrying capacity. The new positive sites are principally at the extreme upper catchments of the Wye, suggesting an extension of distribution to the whole length of the river. There are still a number of negative sites on the Elan, both upstream and downstream of the reservoir complex, and on the upper Irfon. In these rivers the fish populations are relatively poor, probably because of the impact of acidification.

A further 70 sites on the Wye were surveyed as part of the Otter Survey of England 2009-10 (Crawford 2010). Of these, 58 (83%) were positive, giving a combined result for the whole Wye catchment of 182 positive out of 199, (91.5%). Otters re-colonised the English part of the Wye catchment from upstream during the 1980s (Crawford, 1979, 1984; Strachan *et al.*, 1990) and were using all watercourses in the catchment by 1993. It is likely that this population of otters, together with those from the Severn, has helped drive the recovery of otters into the English Midlands.

4.16 Ystwyth – Hydrometric Area 63



4.16 Ystwyth – Hydrometric Area 63

General 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 Rheidol and Ystwyth rise from the vicinity of Pumlumon in the Cambrian Mountains, and flow through steep rocky valleys before opening out into low lying pastures. The Rheidol is regulated as part of a hydro-electric scheme, with a large dam at Cwm Rheidol Reservoir.

The Aeron, with other rivers in the southernmost part of the area, rises from lower hills. The majority of the rivers are short, flowing through steep, wooded valleys. 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 Water Framework Directive records the various waterbodies as obtaining good ecological status. However there are some problems associated with historic mining activity, with the discharge from metalliferous mine water causing localised pollution in the upper reaches of the Rheidol and Ystwyth. These rivers also show surface water acidification due to base-poor geology and extensive conifer plantations.

The rivers support migratory salmon, sea trout, lamprey and eel, although weirs and dams are barriers to upstream movement locally. However, the upper reaches support populations of wild brown trout and lakes and reservoirs provide a number of stocked coarse and trout stillwater fisheries.

Results of 2009-10 Survey and Comparison with previous surveys.

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

* Sixty-four sites were noted in the 1977-78 survey report, but only 63 field sheets were available.

Discussion

The overall results for the hydrometric area described an increase from 72% of sites positive in 2002 to 89% in 2009-10. This was most marked on the upper reaches of the Ystwyth and its associated reservoirs.

The negative sites are generally scattered around the headwaters of the Clarach, Rheidol and Ystwyth, all areas of relatively low productivity, a considerable degree of afforestation and a history of metal mining. These sites are also close to sites in the southern part of the Dyfi hydrometric area which were also negative.

5. Discussion

5.1 Interpretation of the results and national trends

The present survey is the fifth in the series of national surveys for Wales. Signs of otters were recorded at 996 sites out of a national total of 1108 giving the percentage of positive sites as **89.89%**.The results show a continued trend of recovery for the otter, with some individual catchments attaining full capacity for the species. Out of 1108 sites surveyed across Wales, only 112 were negative for otters at the time of survey

The Otter Survey of Wales was divided on the basis of 15 hydrometric areas in accordance with previous Otter Surveys of Wales (established as baseline data 1977-78), and is presented here to aid comparison of data. Four catchments were of particular concern in 2002, Anglesey, Mid Glamorgan, Taff and Glaslyn/Lleyn. These have now shown an impressive expansion in sites occupied by otters.

Extensive growth in the population in Wales is entirely due to natural re-colonisation. The population has extended into areas of England, crossing watersheds and following major water courses such as the Dee, Severn and Wye.
No captive bred otters have been released in Wales, although there have been a small number of rehabilitated orphaned or injured animals that have been returned to the wild following care in captivity. In each case this has been to the watercourses where they had been found. The number of rehabilitated animals returned across the whole of Wales since the 1980s has only been between 15 – 20 animals.

National otter surveys have also been carried out in England and Scotland – taking place approximately every seven years. These surveys began in the 1970s and noted the presence and absence of otters at selected sites based on field signs. The data collected have provided information on changes in otter distribution, and inferences have been drawn about changes in population size (e.g. Strachan & Jefferies, 1996; Green & Green, 1997). However there are still no robust data on population trends.
The main problem with monitoring otter populations is the lack of a clear relationship between the density of signs and the density of otters. There is currently no extensive method of reliably estimating otter density (Kruuk, 1999; Chanin, 2003). The use of DNA extracted from spraints may provide a solution to this in the future and has already given some insight about the numbers of otters using parts of North Wales (MISE in prep).
Coastal otter population density has been related to holt density in Shetland (Jim Conroy, pers. comm.) but this relationship has not yet been reliably applied elsewhere. Around the Welsh coast and sheltered bays, excellent habitat for otters can be found. It is generally thought to support a higher density of otters per linear length (of coastline) compared to the same linear length of freshwater river and lake system.

The interpretation of the results described in the preceding section must be made with care, as otters can have extremely large home ranges – up to 40km or more for males (Kruuk et al., 1993). An increase in the number of positive sites may not necessarily equate to an increase in the number of otters present. However, the sampling strategy was designed to detect trends in the relative abundance of otters within the whole of Wales and its constituent hydrometric areas. Analysis of the trends in each hydrometric area (Figure 1 and Tables 3 + 4) confirmed highly significant increases in the number of sites with otter signs for Anglesey, Glaslyn/Lleyn, Mid Glamorgan, Taff when compared to the previous surveys. The increase in the number of sites occupied was consistent with a population of otters that had both extended and consolidated its range.
Figure 1 and Tables 3 & 4 clearly show that both the Teifi and Cleddau catchments had no significant increases or decreases. This suggests that the otter population was stable and probably at or close to carrying capacity. The Lougher, Wye, Tywi, Clwyd and Conwy are also at or close to carrying capacity for otters in 2009-10.

5.2 Geographical patterns and local trends

In North Wales the otter has continued to consolidate its range and is now widespread in the hydrometric areas of Glaslyn/Lleyn, Conwy/Clwyd and Dee. The Dyfi has also shown an improvement, but the rate is slower than in adjacent areas. The most impressive expansion however has been on Anglesey, with an impressive leap from 18% positive in 2002, to 67.5% positive in 2009, with new sites to the west and north of the island.

West Wales showed a high percentage occupation of sites sampled in the Cleddau, Teifi, Tywi and Loughor, and it is likely that these catchments have reached close to carrying capacity.
The Ystwyth hydrometric area had also shown an improvement, but like the Dyfi the rate of new sites is slower than adjacent areas.
The upper Severn catchment and upper Wye catchment showed a high level of site occupancy, with both areas approaching carrying capacity for otters.

In South-east Wales the Usk, Taff and Mid Glamorgan rivers all showed impressive improvement since the 2002 survey. In particular, Mid Glamorgan showed an impressive leap from 18% positive in 2002 to 70% positive in 2010. Otters can now be found using many of the rivers of the valleys, even where disturbed by human activity. On the River Taff and River Ely, otters can now be found in the middle of Cardiff

An increase in otter distribution cannot be directly translated into an increase in otter numbers. However such an increase in distribution must represent a significant increase in the number of otters on the rivers and wetlands of Wales. The tolerance of otters to apparently high disturbance situations such as city centres is far higher than was thought. They appear to select low disturbance habitats where possible, but at least some otters are willing to tolerate high levels of human disturbance under some circumstances. It is likely that there is a variation between individual otters in their tolerance of human disturbance.

5.3 Coastal Otters

In Western Wales there are over 700 kilometres of coastline with 79 designated bathing waters and 25 designated shellfish waters. Much of the coastline is also protected under European conservation legislation for important marine species and habitats. There are major ports at Milford Haven and Holyhead, and important commercial shell fisheries in the Burry Inlet (Loughor), Three Rivers (Tywi, Cywyn and Gwendraeth), Conwy and the Menai Strait. Not surprisingly, the use of the coast by otters has been evident in the present survey, including an increase in the number of positive sites in the Neath, Ogmore, and all three Cardigan Bay coastal water bodies. An increase in positive sites was also noted around the North Wales coast, including the Glaslyn, Mawddach and Dyfi estuaries. These latter sites form part of a study on use of the coast and otter diet by the Dwyryd Otter Partnership/Snowdonia Mammal Group 2002-2004 (Hall, C. & Williamson, K. (2003) Strachan R, Williamson K, Hall C & Baylis J (2006). More recently, the Mammals in a Sustainable Environment (MISE) Interreg project 2010-2012 looked at the use of DNA extracted from spraints to provide population estimates (MISE in prep).

The estuary water bodies in the Severn River Basin District include the main Severn Estuary, which has been split into three parts: upper, middle and lower, and the tidal reaches of the rivers Wye and Usk. The Severn Estuary is internationally recognised for nature conservation, being designated as a Special Protection Area, Ramsar site and Special Area of Conservation. However the otter is not a feature of interest. The estuary is an important migratory route for salmon, eel and lamprey, and internationally rare species such as shad. The number of otter survey sites that cover the estuary are very few, nevertheless all showed positive evidence for the species.

The Tidal Dee catchment covers the streams and rivers that flow directly to the Dee estuary on both the English and Welsh sides. These include Afon Y Garth and the Swinchiard, Wepre and Shotton Brooks in Wales. Frequently, the water courses were physically modified with culverts and flood embankments in their lower sections, and so are designated as heavily modified water bodies under the Water Framework Directive. Only a single site was surveyed within the Dee Estuary, at the point of Ayr. This location had been found positive in 2008 (R. Strachan pers.obs), but it may have been a transient animal using the site at that time.

5.4 Otter population density, carrying capacity and breeding requirements

Surveys using otter signs can only measure otter occurrence and not population size. While it is clear that there must be a relationship between local otter density and the numbers of spraints that can be found by surveyors, the relationship is not clear (cf. Mason & Macdonald, 1993; Strachan & Jefferies, 1996). For the 2009-10 survey report, as with the 2002 report, the only assumptions made are that the presence of otter signs

indicates that an otter has recently been present at that site. It is also assumed that the number of sites in a catchment at which otter signs were found, gives some measure of the length of river occupied by otters. Without the use of DNA analytical techniques it has not been possible to link the numbers of otters present to numbers and distribution of spraints found.

For the purposes of this report, and to be consistent with the Fifth Otter Survey of England 2009-10 (Crawford 2010), full carrying capacity is defined as over 80 per cent of sites positive for two successive surveys at least five years apart. As such, it is assumed that if the level of positive sites has remained at over 80 per cent for five years or more, then otter have been regularly breeding and their numbers will have increased to a level where they will be largely self-regulating, with few if any unoccupied territories. Otter territories will vary in size in response to the available food supply and habitat quality. Using the above criteria, the hydrometric areas, Cleddau, Clwyd, Conwy, Dee, Loughor, Severn, Teifi, Usk and Wye are all at carrying capacity for otters. All these catchments are therefore thought to sustain regular breeding by otters.

The breeding requirements of otters are reviewed in Liles (2003). In that review, the term *breeding site* is used to describe an area of land that contains one or more den sites, security from disturbance, play areas for cubs, no risk of flooding and access to a good food supply. This is distinct from the term *natal holt*, which describes a small space occupied by the female when she gives birth, and where the cubs stay for up to three months. Due to the secretive nature of the female when cub rearing, natal holts can be difficult to find. In terms of conservation of otters in Wales and elsewhere, the identification and protection of breeding sites should be regarded as a priority.

Liles (2003) proposed that the conservation of otter breeding sites should be tackled at the river catchment or sub-catchment level. Within the catchment, optimal breeding sites are those that can be used by otters over a period of many years. Sub-optimal sites may be used on a temporary basis, or may be prone to problems such as submergence during flood events.

Liles (2003) recognised three conservation actions that are likely to be required in order to ensure that breeding sites are available:

i. Protecting existing breeding sites (both actual and potential).
ii. Creating or enhancing new sites for otter breeding.
iii. Protecting or creating feeding sites associated with breeding sites.

All three actions should be incorporated into the various site management plans associated with any of the designated sites where otters occur i.e; those Special Areas of Conservation where otters have been identified as a feature.

5.5 Habitat and food availability

If the definition of habitat is considered in its broadest sense, it provides otters with both food and a place of refuge. Although in-stream habitat has a particular importance for fish, many fish species are dependent on a variety of river habitats for different life stages, such as spawning, fry, juveniles and adults. In addition to these life stages some species, such as salmon, sea trout, lamprey and eel, must be able to migrate between rivers and oceans.

Estuaries may provide particularly rich foraging habitat for otters, with saltmarsh creeks and mudflats providing seasonally important nursery areas for marine fish such as sea bass, mullet, whiting, smelt and flounders. At other times of the year, freshwater pools and ponds are sought out by otters in order to hunt frogs that gather to breed. Otters may search and travel over small watercourses of low productivity in order to locate spawning ponds in the spring (Weber, 1990; Kruuk 1995; Chanin 2003; Strachan *et al* 2006).

As with all species, the carrying capacity of any environment is largely a function of food availability and the availability of lying up and/or breeding sites. However human persecution can be a major limiting factor, particularly with respect to predators. Other anthropomorphic effects such as road deaths and disturbance may also be important. It is difficult to separate these factors, but where refuge sites are plentiful then food supply could be the limiting factor (Kruuk, 1995). Although otters will take a wide variety of prey, they are very much fish specialists and the biomass and availability of fish species is therefore a key issue. The prey requirement and food needs of otters were reviewed in Chanin (2003). The daily energetic requirements for the otter suggest that between 1–1.5kg of fish must be consumed. This fact, combined with the very large and variable home range size of otters, makes it difficult to determine the lowest level of fish availability below which it ceases to be possible for an otter to exploit a river system. Otters may use a fishless river if it provides access to a well-stocked stillwater.
Improving river habitat quality in Wales has been the focus of a number of initiatives over the last 20 years including Sustainable Fishing Wales schemes, in-stream and riverbank works conducted by the various Rivers Trusts, Biodiversity Action Plan projects and Water Framework Directive projects. In each case, the primary focus has been riparian and river habitat improvement and enhancements to benefit the salmonid fish populations.

The main factors which have historically limited fish populations have been poor water quality and the historic physical degradation of river habitat through engineering works. Today the water quality in Welsh rivers, particularly in urban areas such as Cardiff, Newport, Neath-Port Talbot and Swansea, are generally much improved. This is mainly due to investment in sewerage infrastructure to reduce the impact of episodic pollution from storm-water run-off, and in sewage works to improve the quality of the final effluent. There is, however, still significant room for improvement on a number of rivers. Many of these have been the subject of investigation and prioritisation for remediation under the Water Framework Directive 2003 (see below).

5.6 Water Quality, Water Framework Directive and Otters

The European Water Framework Directive came into force in December 2000 and became part of UK law in December 2003. It gives an opportunity to plan and deliver a better water environment, focusing on ecology. The Environment Agency/Natural Resources Wales are the competent authorities to deliver the Water Framework Directive in England and Wales.
In 2007, the Environment Agency made a change to the way they assess the status of water bodies. For twenty years, they have been using a General Quality Assessment (GQA) scheme to assess river water quality in terms of

chemistry, biology and nutrients. GQA has helped drive environmental improvements by dealing with many of the major point sources of pollutants, such as discharges from sewage treatment works or other industry. Through the Water Framework Directive, the Environment Agency has now taken a more comprehensive way of assessing the whole water environment that will help direct action to where it is most needed. The assessment covers both surface waters and ground waters and integrates water chemistry with ecological receptors. For a water body to be in overall 'good' status, both ecological and chemical status must be at least 'good'.
Reporting rounds for the Water Framework Directive (2012, 2015 and 2027) have set targets for Good and High Ecological Status (or Good Ecological Potential for those heavily modified water bodies such as canals) where the quality of both surface waters and ground waters have deteriorated as a result of various pressures such as pollution. Wales is split into 3 River Basin Districts. Published in 2009, the various River Basin Management Plans (RBMP) stated:

- In the Western Wales River Basin District 29% per cent of surface waters meet good ecological status/potential or better; 71% per cent do not meet good status but have moderate status. 96% of groundwater bodies are at good quantitative status with the rest being poor status.
- In the Severn river basin district 29 per cent of surface waters meet good ecological status/potential or better; 71 per cent do not meet good ecological status/potential (619 water bodies). 75 per cent of groundwater bodies are at good quantitative status with the rest being poor status.
- In the Dee River Basin District 28 per cent of surface waters meet good or better ecological status/potential; 72 per cent do not meet good status (79 water bodies). 83 per cent of groundwater bodies are at good quantitative status with the rest being poor status.

The majority of surface water bodies that failed to meet good status was because of the poor fish diversity and abundance due to the many man-made barriers to fish migration (such as impassable weirs). Elsewhere, failures were due to high phosphate levels, poor numbers of diatoms, poor numbers of invertebrates, or pollution from priority substances such as heavy metals. As such the RBMPs have identified priority catchments for future improvement with tight timeframes to hit the target dates.

5.6.1 Phosphates in water

High phosphorus concentrations are the main cause of eutrophication in fresh waters. Eutrophication is the enrichment of waters by nutrients, causing excess plant/algal growth and leading to undesirable effects on the ecology. These include reduction in fish, and by definition the numbers of otters present, water quality and uses of water. Activities that can be affected include water abstraction, water sports, angling, wildlife conservation and livestock watering. In standing fresh waters, blue-green algal blooms can occur; many such blooms are toxic, and pose a hazard to humans involved in water sports and to animals that drink the water.

Welsh Assembly Government has identified phosphate standards to support Good Ecological Status in fresh waters. They will be applied such that measures will be targeted to water bodies where there is evidence that nutrient levels are causing undesirable ecological impacts. Benefits should be seen from the planned introduction of phosphate reduction at sewage treatment works discharging to waters identified as Sensitive Areas under the Urban Waste Water Treatment Directive (1991).

Reducing phosphorus pollution has been one of the aims of the Environment Agency Wales Catchment Initiative 2011. It was also included in the Welsh Land Management Scheme (Glastir) which commenced in 2012. It is estimated that over 46% of the total length of river water bodies in Wales are at risk, or probably at risk, from diffuse phosphorus from agricultural pollution. In addition, the impact of agricultural pollution from farm wastes, artificial fertilisers and other agri-chemicals, is now a growing focus of concern for both the statutory agencies and the agricultural sector.

5.6.2 Sedimentation and diffuse pollution

Much of the sediment present in a river system is caused by the erosion of soil. Whilst there is a natural level of erosion, it is the increased rates of erosion, caused by land based activities such as forestry, construction and, particularly, agricultural cultivation and grazing practices, that need to be addressed. It is worth noting that phosphorus is often associated with sediment as it is bound to soil, unlike nitrates, which are more soluble. Metals and many toxic organic compounds can also accumulate in sediments.

High concentrations of suspended solids can:

- Cause suffocation of fish eggs by burying them in the stream bed or coating their surface if they are on vegetation,
- Cause physical damage to fish gills, which can result in death, a reduction in growth or cause a reduction in resistance to disease.
- Reduce populations of river bed animals which are the food of fish.
- Suppress photosynthesis due to a reduction in light penetration and by coating river plants, thus reducing productivity in a river

The insidious impact of chronic diffuse pollution (as agricultural run-off) on the quality of our river environments is a very difficult problem to solve. The Salmon Stock Conservation Review (2004) identified sedimentation as the single most important factor as cause of failure in 12 of the 22 Welsh Salmon Action Plan (SAP) rivers. Any reduction in fish numbers will therefore reduce the ability for that river to support a thriving population of otters.

5.6.3 Organic pollution

Organic pollution is comprised of ammonia and biochemical oxygen demand. The toxicity of ammonia to fish and other aquatic life is dependent on the pH and temperature of the water. Increasing pH increases the proportion of toxic 'free' ammonia. Biochemical oxygen demand is not an individual pollutant, but a measure of the amount of biodegradable organic matter present. Much of the pressure from organic pollution is the result of discharge of treated sewage effluent. Tightening of discharge standards and cessation of

discharge of raw sewage to coastal waters over the past 15 years has resulted in marked improvements in water quality. Nevertheless, the 2009 River Basin Management Plan assessments showed that:

- 151km (4% of total length) of river water bodies within the Western Wales River Basin District were at risk of failing biochemical oxygen demand (BOD) standards
- 236km (6% of total length) of river water bodies within the Western Wales River Basin District were at risk, or probably at risk, of failing the ammonia standards
- 809 km (10% of total length) of river water bodies within the Severn River Basin District were at risk, or probably at risk, of failing the ammonia standards
- 735 km (9%of total length) of river water bodies within the Severn River Basin District were at risk of failing the biochemical oxygen demand (BOD) standards
- 75 km (10% of total length) of river water bodies within the Dee River Basin District were at risk, or probably at risk, of failing the proposed ammonia standards
- 48km (6% of total length) of river water bodies within the Dee River Basin District were at risk of failing the proposed biochemical oxygen demand (BOD) standards

A high concentration of biochemical oxygen demand exerts a high oxygen demand on water, leading to oxygen depletion with potentially severe impacts on the whole ecosystem leading to both invertebrate and fish kills. With a reduction in fish will come a reduction in ability for that catchment to support otters.

5.6.4 Bio-accumulated Contaminants

An assessment of pesticides in rivers was reported under the Water Framework Directive in 2009. This showed that for the Western Wales River Basin District some 155km of rivers were at risk, or probably at risk, from diffuse agricultural pesticides, and 1897km of river was at risk, or probably at risk, from sheep dip. For the Severn catchment as a whole, 2940 km of rivers were at risk, or probably at risk, from diffuse agricultural pesticides, and 1888 km of river was at risk, or probably at risk, from sheep dip. For the River Dee catchment some 114 km of rivers were at risk, or probably at risk, from diffuse agricultural pesticides, and 407 km of river was at risk or probably at risk from sheep dip.

The bioaccumulation of persistent contaminants (such as agricultural pesticides, organochlorines and mercury) in aquatic food chains is well known (see Strachan & Jefferies, 1996, Mason & Macdonald 1993). Otters are top predators in aquatic systems and, being relatively long lived, are prone to accumulating contaminants in tissue, especially the liver (Jefferies & Hanson 2001).

Since 1992 otters found dead in England and Wales have been sent to Cardiff University for post mortem examination. Liver samples have been taken and pollutant concentration analysed by Environment Agency laboratories.

Of 38 pollutants measured from 755 otters between 1992 and 2009, 13 were detected in >80% of samples: Dieldrin, ppDDE, ppTDE, HCB, and PCB congeners 105, 118, 128, 138, 153, 156, 170, 180 and 187. (Kean & Chadwick 2012). Nine of the thirteen frequently occurring pollutants declined significantly over the 18 years between 1992 and 2009 (dieldrin, ppDDE, and PCB congeners 105, 118, 138, 153, 156, 180 and 187). No significant trends with time were found in ppTDE, HCB, PCB 128 or PCB170.
Bone tissue samples clearly showed that lead levels had now declined to very low levels compared to those recorded at the start of the study in 1992 (Kean & Chadwick 2012). This was because the main source of environmental lead in rivers had been derived from the use of lead in petrol engines as an anti-knocking agent. Un-leaded petrol is now the norm for most vehicles.
Kean & Chadwick (2012) also found that the concentration of the various persistent organic pollutants associated with health problems for otters was unclear. However for most pollutants the concentrations that were recorded between 1992 and 2009 exceeded the risk levels reported for other mammals. High pollutant levels in juveniles and low levels in adult females compared to adult males, can be explained by the well documented transfer of fat soluble pollutants to offspring via the placenta and during lactation. The increase in pollutant burdens from sub-adult to adult among males reflected accumulation over time. Higher levels of pollutants in otters that died from infection and/or emaciation might suggest a causative relationship between contaminants and ill health. It is probable however that mobilization of lipids in sick or starving animals had led to the measurement of elevated levels (Kean & Chadwick 2012).

Another suite of bio-accumulated contaminants are the heavy metals, including cadmium, mercury, zinc, lead, copper and tin. These are known to build up in liver, kidneys or bone tissue of otters causing toxic effects. In Wales, Tributyltin has been used as a biocide and anti-fouling paint for boats. However it was also used in wood preservation, paper and pulp and textiles. European regulatory controls now prevent its use in products for the EU market. Whilst its use has now been restricted, it remains highly persistent in the environment and as such tin continues to be recorded from the tissue samples of Welsh otters.

Mine waste water discharges are known to be of concern in the Glaslyn, Dyfi and Ystwyth hydrometric areas. These are usually acidic (low pH) and the main contaminants are metals, such as copper, iron, manganese and zinc. Mine water may also contain priority substances such as cadmium and lead. These contaminants are released when oxygen in the air or water reacts with minerals in the rock found near coal seams and mineral veins. The metals are then dissolved in the groundwater which discharges back into surface water bodies, or by rain in the case of spoil heaps. Such mine water related pollution may have significant ecological impacts through toxicity to aquatic invertebrates and fish, or bio-accumulation in otters.

5.6.5 Endocrine Disrupting contaminants

Hormones control essential processes in animals and plants, such as growth, metabolism, reproduction and the functioning of various organs. Some chemicals can disrupt the normal working of the hormonal system (or endocrine system), and these are referred to as 'endocrine disrupting substances'. These substances may mimic the action of natural hormones, block their action, interfere in feedback mechanisms or have other effects. There is considerable evidence of impacts on fish development, growth and reproduction, demonstrated particularly where male fish have become feminised. The severity of the effects of endocrine disrupting substances depends on a range of variables which are not yet fully understood. These include duration of exposure, possibly at particular stages in the life cycle, the nature of the particular substance and the susceptibility of the biological receptor. Leachates from historic land fill sites may contain a suite of chemicals that may cause endocrine disruption.

The two active ingredients used in sheep dip products are diazinon and cypermethrin. Both these substances are highly toxic to invertebrates and very small quantities in rivers can cause severe ecological damage. Studies have also shown that they can interfere with salmon reproduction by disrupting the ability of the male fish to respond to female hormones.

The effects on otters are not fully understood, but if these chemicals are persistent and can bio-accumulate in tissue, then they pose a risk to fertility of the species and future recruitment.

5.6.6 Acidification

Acidification is the process whereby nitrogen oxides, sulphur dioxide and ammonia released into the atmosphere are converted into acidic substances. Acidification can cause toxic metals to leach out of soils and enter surface or groundwater. Various land-use practices such as farming and forestry can lead to acidification of watercourses, causing loss of sensitive plants and animals. At present, there is no evidence of a serious impact from acidification on Welsh rivers, except where there are still discharges entering the watercourses from disused metal mines.
River Basin Management Plans (Anon 2009) showed that of 814 river water bodies in the Western Wales River Basin District, some 138 (17%) were at risk, or probably at risk, of failing WFD objectives in 2015 due to acidification. In the Severn River Basin District, of 791 river water bodies, 44 (5.6%) were at risk, or probably at risk, of failing WFD objectives. In the Dee River Basin District, of the 87 river water bodies 18 (21%) were at risk of failing the WFD objectives in 2015 due to acidification.

High acidic rainfall combined with afforestation of many upland areas was highlighted as a growing cause for concern, linked to the local decline and density of otters (Green & Green, 1997). The estimated maximum amount of deposited and scavenged acid (acidic pollutants taken directly from the atmosphere by conifer trees), which a given ecosystem can absorb without harm, is called the critical load. In the UK the critical load is set at pH4.5, which is lower than that for both the USA – pH5.5, and Scandinavia – pH5.0. Acidification results from depositions of both sulphur and oxidised

nitrogen (NOx), and the critical load function and its exceedance, depend on the amount of both these pollutants.

Critical loads for acid deposition were, and still are, exceeded across one third of the Welsh uplands, most significantly over the Cambrian massif. Despite recent falls in sulphur and nitrogen deposition in precipitation, upland locations in the Cambrian massif still receive 15-25 kg S/ha/yr and 20-25 kg N ha/y.
Acid critical loads represent a quantitative estimate of the exposure risk below which significant harmful effects on certain sensitive biological components do not occur. By definition, critical load exceedance represents a significant risk of ecological damage.
Acidic water can not only reduce the availability of invertebrates that fish prey on, but can elevate aluminium levels in the water to a toxic level for fish. The primary impacts are on sensitive species such as salmon and bullhead, both of whose range should extend into the acid areas of rivers like the Wye. Salmon alevins are killed by pH below 5.5. Recent evidence suggests low pH also affects the osmoregulation ability in salmon smolts, and so impairs their ability to adapt to salt water when migrating to sea. Bullhead are not found in water courses where pH drops to less than 5.5.
A severe reduction or complete absence of fish is likely to impact on otter distribution.

5.7 Road traffic mortality

Road casualties have been recognised for many years as a potential threat to otters in Wales. Jones & Jones (2004) and Green & Green (1997) considered that road traffic was the largest and most rapidly expanding cause of otter mortality across the whole of the British Isles.
Figure 2 depicts the rise in the number of recorded otter road deaths in Wales since 1978 in relation to the results of the 5 national surveys. It can be clearly seen that as the relative abundance of otters has increased, so has the number of otters killed on roads. The distribution of otter road mortality sites has been plotted in Map 23. Otter road deaths continue to be recorded throughout Wales, averaging between 50-60 animals a year by 2012. At present road deaths do not appear to be limiting otter population growth, although mortalities may lead to a temporary absence of otters from an area until they are replaced by dispersing animals.
In Wales, the Roads and Otters Steering Group (ROSG), is a Welsh Government lead partnership of organisations and individuals interested in the implementation of mitigation for otter deaths. Data from otter road mortality has allowed black spots to be identified and remedial measures put in place where appropriate. These sites are known in Wales as priority otter road mortality sites or PORMS.

Grogan, Philcox and Macdonald (2001) carried out an investigation into the extent of otter road mortalities in England and Wales. They developed detailed advice on mitigation techniques to reduce otter mortality that had been incorporated into the Design Manual for Roads and Bridges (DMRB) as technical guidance.

Grogan *et. al*. 2001 provided clear evidence that otter road deaths peak at such times as high rainfall and spate conditions, when otters are forced out of rivers by high flows and surcharged culverts. Today much effort is put into the provision of otter mitigation measures for new road schemes, bridge replacements and road widening schemes. A significant but un-quantified resource has been put into underpasses, ledges and otter-proof fencing. The Design Manual for Roads and Bridges (DMRB) is currently under review to include design specifications for safe otter crossings within new road building schemes.

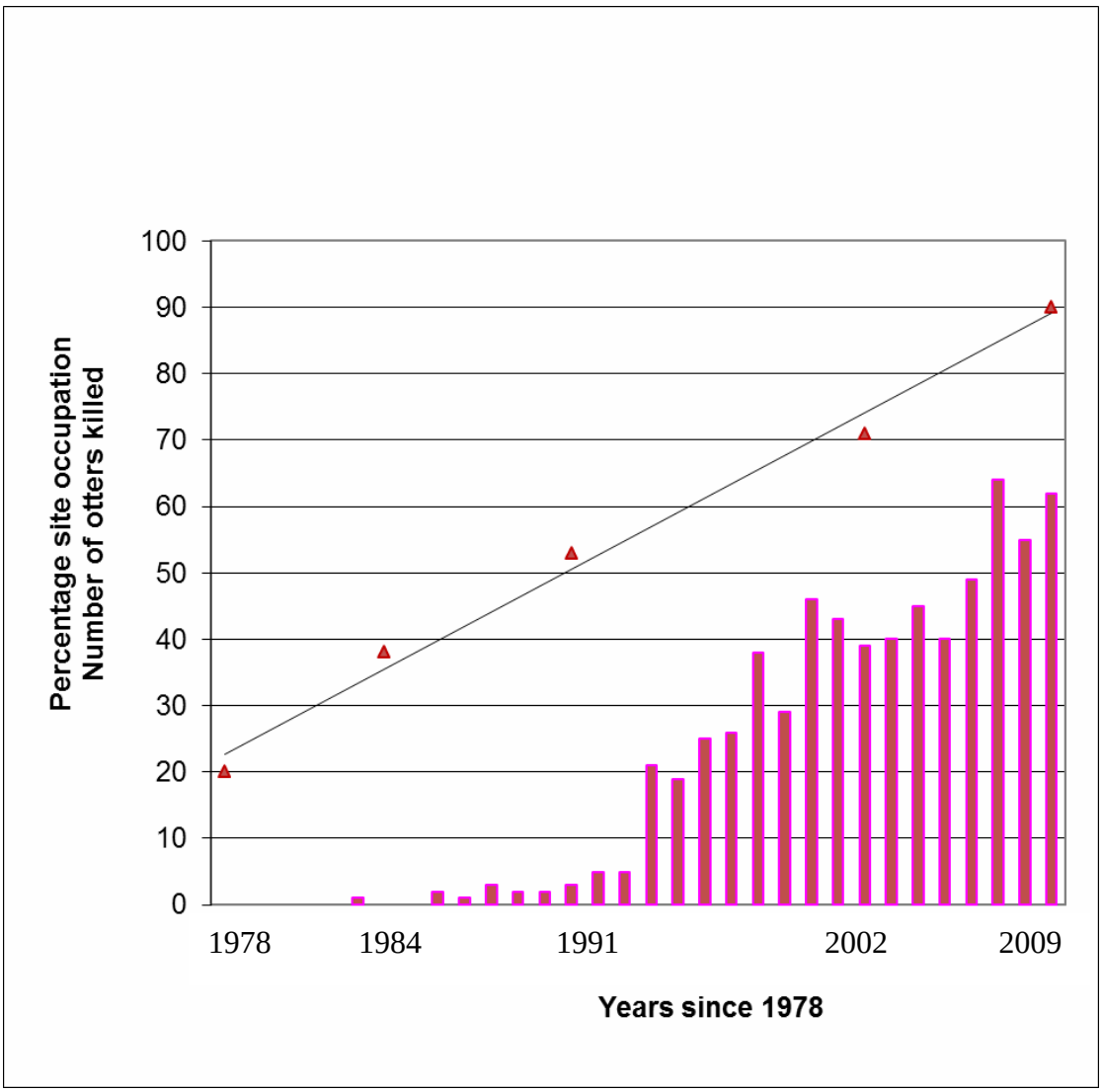
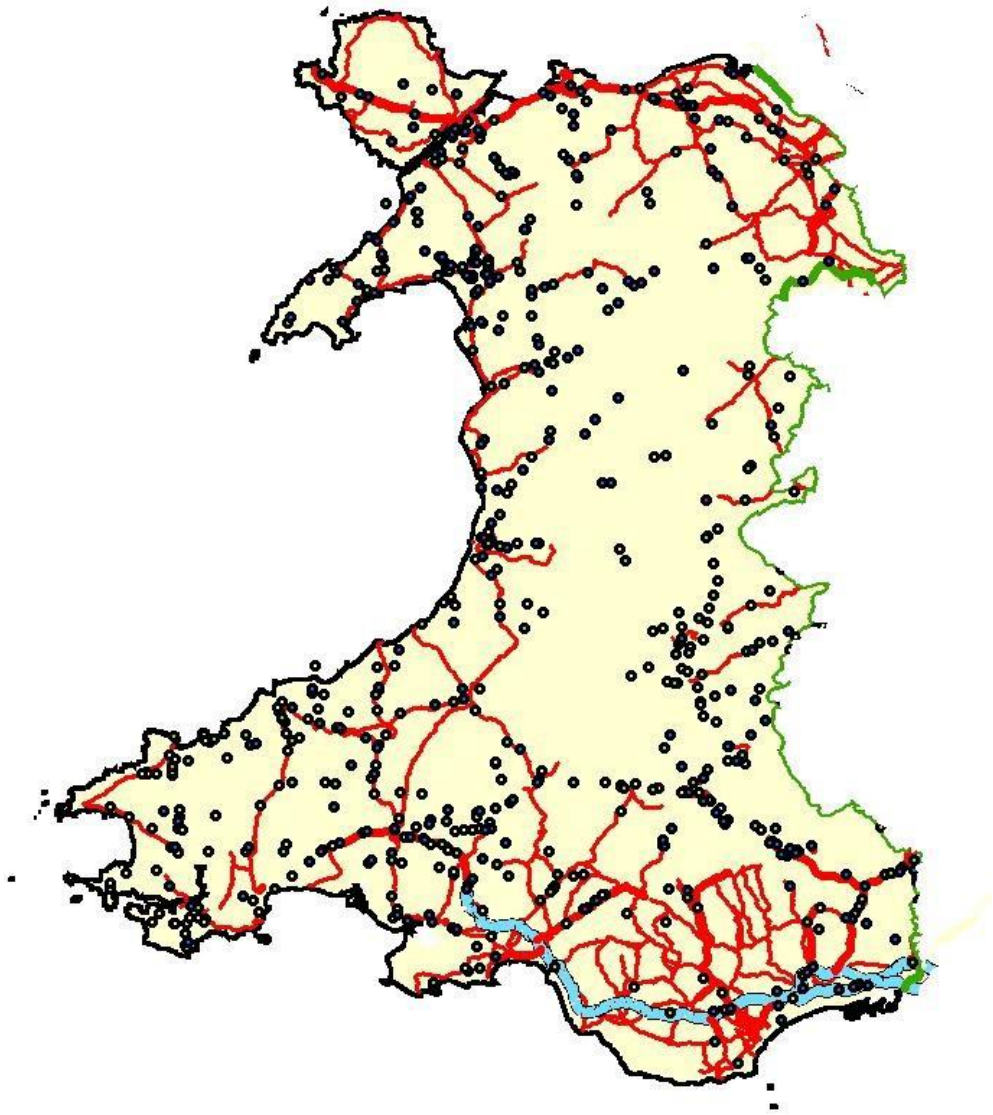


Figure 2: Rise in the number of recorded otter road deaths in Wales since 1978 (bars) in relation to percentage of positive survey sites in the 5 national surveys (red triangles). As the relative abundance of otters has increased, so has the number of otters killed on the network of Welsh roads.



Map 23: Location of otters killed on roads as recorded by the EAW/Cardiff University Otter Project 1994-2010. The majority of sites recorded are associated with the trunk road and A-road network where traffic density is highest.

Otter ledge incorporated into a road culvert as a feature to allow the upstream movement of otters at times of spate conditions (Photo R. Parry)

Otter dry pipe underpass adjacent to pipe culvert that may fill with water at time of flood. The wall alongside the road has overhanging coping stones to prevent otters from climbing over (Photo J. Jackson)

5.8 Mortality of coastal dwelling otters

The incidental capture and drowning of coastal dwelling otters in lobster creels, crab pots and fyke nets set for eels is well known, but to date, under recorded and poorly quantified. Deaths in fyke nets set for eels are still occurring when the nets do not have otter guards fitted (D.Thorpe, pers. comm.). The Vincent Wildlife Trust has previously provided otter guards free of charge to fyke net manufacturers, suppliers netsmen (Green & Green, 1997) and their widespread use has undoubtedly led to a reduction in accidental drowning.

In Wales commercial fyke netting of eels is no longer an industry, but illegal netting has been recorded and many of the nets used do not have fitted excluders.

Otter mortality caused by drowning in lobster creels and crab pots is another cause for concern but as yet unquantified for Welsh waters. For instance two otter deaths were recorded from crab pots on the North Wales coast in 2008 (R. Strachan, pers. obs.). Many other instances are likely to go unreported and therefore unquantified. Where otters deaths have been reported there have been a number of compounding factors. For instance, lobster creels and crab pots set in a water depth greater than 10m are very unlikely to catch otters. However, the highest risk to otters was when lobster creels baited with whitefish were set in relatively shallow inshore water where there was a rocky substrate, i.e. within a zone most frequently utilised by foraging otters.

Jefferies et al (1984) collected data on otter mortality over a four year period (1978–81) along the east coast of the Uists, Scotland. They found that fish such as saithe, small cod and conger eels swam into the creels and became trapped there. It was been suggested that otters were attracted to the creels by these species rather than the trapped lobsters. Twenty two otter corpses were retrieved for examination in the study, 65% of the drowned otters were female, 25% were juveniles or sub-adult females. This loss of females could have a significant impact on local breeding otters. More of the drowned otters occurred in creels with internal compartments, and most deaths occurred in shallow water at depths of 2–5m at low spring tide level. The greatest depth recorded was an adult male drowned at 15m.

As otters extend their range around the Welsh coast, the extent of this type of otter mortality needs further quantification and new designs of otter proof creels need testing.

Lobster creels in use around the Lleyn, North Wales with and without a solid entrance ring that would allow otter escape (Photo. C. Hall)

5.9 Disturbance and conflicts with man

Sightings of otters have increased in recent years in many of the towns and cities in Wales, as the species has extended and consolidated its range. Today it is possible to find otters in Cardiff Bay, Penarth sea front, Newport, Port Talbot, Carmarthen, Haverfordwest, Aberystwyth, Porthmadog, Caernarfon and Bangor during daylight hours. Breeding holts have been found adjacent to industrial areas such as on the Taff at Merthyr and the Teifi at Llandysul. This gives clear evidence that otters are far more adaptable and tolerant of human presence than previously thought. However there is some evidence that direct disturbance of resting areas by people and dogs will lead to the displacement of otters. Nevertheless, the otter's return reflects the improvement in water quality within the built-up and industrial environment and the consequent increase in fish stocks in urban rivers. The breeding of otters in towns and cities however, may be dependent on the availability of safe refuge sites free from deliberate or accidental disturbance and with a readily available food supply. Such sites for natal holts may be limited within the heart of a built-up area. It is not known whether breeding success in urban areas is comparable with that in more rural environments, or if there is a greater risk of disturbance or even road-kill on the busier urban roads.

Planning authorities are required to take account of protected species and habitat conservation when they consider planning applications. As otters are a European Protected Species, planning authorities have to be satisfied that a development proposal will not have an adverse effect on them. Where planning permission is needed that might affect otters and their habitat, it is required that sufficient information on the species occurrence, whereabouts and use of resting sites is provided to help the local authority make their assessment. All development proposals therefore require gathering of data on protected species to be presented in an Environmental Statement. Where there are negative impacts on otters, this should assess where there may be a conflict, and what measures need to be taken to avoid, reduce or offset the impacts. Such measures may become conditions that will need to be fulfilled following the granting of planning permission. Through development control screening and the Town & Country Planning Act 1990, habitat for otters and important breeding sites in Wales have been identified and protected. There has also been an opportunity to look for "planning gain", on the back of large infra-structure development projects, to create new wetland habitat and even construct secure artificial breeding holts for otters.

5.9.1 Conflicts at Stillwater Fisheries

In 1998 the Environment Agency produced a four-page leaflet, *Otter predation - Is my fishery at risk?* (Environment Agency, 1998) endorsed by a number of angling bodies. This was to alert owners of stillwater fisheries and fish farms to the possibility of otter predation on vulnerable waters. By the time the fourth and fifth cycles of national otter surveys were underway in England and Wales, the issue of stillwater fish predation had gained prominence. There had been much discussion between angling representatives, such as the Specialist Angler's Alliance (SAA), and the members of the UK Otter BAP Steering Group, to consider suitable mitigation techniques such as fencing. The debate led to agreed actions that it was the responsibility of fishery

owners to protect their own waters. Research, funded by the Environment Agency and SAA, looked at the efficacy of different fencing designs in preventing access to food provided to captive Eurasian otters. This study informed the production of the publication *Otters and Stillwater Fisheries* in 2008, produced by the Wildlife Trusts and the Environment Agency and endorsed by the SAA (Jay *et al* 2008). This publication provided background on otter biology and legislation and offered advice on planning and constructing otter-proof fencing. The publication is still available as a free download from the EA and SAA websites. The costs of otter proof fencing will vary from site to site, as the fencing will need to be fitted to prevent animals from burrowing underneath or climbing over. The overall costs can be very expensive at around £5,000 - £10,000 per kilometre.

In 2013, a court case was brought against the Environment Agency by a fish farmer on the River Cegin, near Bangor. This was for the alleged loss of fish due to otter predation, and the allegation that the Environment Agency had encouraged otters into the area by building holts. The claim was for damages in excess of £2,000,000, for loss of income from fish sales reported to be 22,000 carp. The Environment Agency robustly refuted the claims, and were able to demonstrate that otters were known to have been on the River Cegin at the time the fishery was built. This was pointed out to the owner at the time under the planning consultation. As it was up to fishery owners to protect their own waters from otters, he would have been given help and advice if it had been sought at the time. The judged ruled in favour of the Environment Agency (http://www.bbc.co.uk/news/uk-wales-north-west-wales-21617168).

In recent years there have been dozens of news stories of otters coming into gardens to raid fish ponds. This bold act of raiding garden ponds has often led to the question of whether these otters were derived from captive origins, or from being over-stocked on the river catchment. However, it is actually a natural consequence of the recovering otter population exploring its home range, which will include garden ponds that are close to rivers, streams or canals. While many people welcome the opportunity to see wildlife close to their homes in this way, many garden ponds are stocked with Koi carp and other fish. These fish can be very valuable and the loss of family pets in this way can be distressing. As with stillwater fisheries, current advice is to erect otter proof fencing if valuable fish are to be kept in ponds near watercourses.

5.10 Special Areas of Conservation for otters

There are 13 Special Areas of Conservation in Wales where the otter is a feature of interest. Although the national survey sites overlap with SAC boundaries, the series of sites may not give sufficient information to assess whether otters are at favourable conservation status. For this the survey would need to be more exhaustive in its search for signs of otter activity and locate the majority of possible holt sites. It would also need to investigate the relative value of the habitats at the site, in the context of the other habitats nearby, or other parts of a watercourse, and the apparent level of use of these areas by otters. In particular it is important to confirm that suitable breeding sites are available throughout the river catchments, and that otters are actually breeding. In the last SAC monitoring reporting round 9 SAC sites with otter as a feature were considered to be in Favourable Condition. Four were considered to be in Unfavourable Condition, but this was mainly due to the difficulty in confirming breeding, one of the main performance indicators, (Liles 2006).

The 13 Special Areas of Conservation in Wales where the otter is a feature of interest are shown in Map 24 and described below:

5.10.1. Afon Gwyrfai a Llyn Cwellyn/ River Gwyrfai and Cwellyn Lake SAC

The Gwyrfai is a good example of the small, steep rivers that occur in north-west Wales. The conservation value of the site is enhanced by the presence of good adjacent river corridor habitat, and by the presence of Llyn Cwellyn, a glacial lake that supports rare plants and fish. Otters are known to breed around the lake shores and along the river course, but are a secondary feature of interest.

5.10.2. Afon Dyfrdwy a Llyn Tegid/ River Dee and Bala Lake SAC

The source of the River Dee lies within the Snowdonia National Park. Its catchment contains a wide spectrum of landscapes, from high mountains around Bala, steep-sided wooded valleys near Llangollen, to the rich agricultural plains of Cheshire and north Shropshire. The site supports extensive areas of flowering water plants and the rare Floating Water-Plantain as a primary reason for designation. There are several important species of fish that use the area including Sea, River and Brook Lamprey, Bullhead and Atlantic Salmon. Otters are a secondary feature of interest, but are known to breed throughout and so maintain favourable conservation status.

5.10.3. Afon Eden – Cors Goch, Trawsfynydd SAC

This tributary of the Afon Mawddach lies within a little-modified catchment and supports the only population of freshwater pearl mussel *Margaritifera margaritifera* in Wales that is regarded as viable. It also supports the rare plant Floating Water Plantain as primary reason for notification. Otters are a secondary feature of interest that are known to breed around Trawsfynnydd Lake and within the Afon Eden.

5.10.4. Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC

Pen Llyn a'r Sarnau on the north-west coast of Wales includes excellent examples of sandbanks, estuaries, coastal lagoons, shallow inlets and bays. This site also encompasses a varied range of reef habitats, including an unusual series of submerged and intertidal glacial moraines. The areas of bedrock, boulders, cobbles, sandy rock, surge gullies and the tide-swept area of Bardsey Sound, support a diverse array of plant and animal communities. Otters are present as a qualifying feature, but not a primary reason for site selection. The SAC provides otters with excellent foraging and a wide variety of marine prey. Females with cubs have been observed in many places around the coast, suggesting regular breeding within the SAC.

5.10.5. Cors Caron SAC

Cors Caron is one of the largest wetland areas in Wales and feeds into the River Teifi. Historically it is a very important site for otters. It has been an important source of breeding otters for the River Teifi and probably other catchments such as the Severn and Dyfi, as otters disperse from this core site. Cors Caron also provides a very important amphibian food resource for breeding otters in spring.

5.10.6. Afon Teifi/River Teifi SAC

The Teifi in West Wales holds otter throughout much of its catchment. The river has suitable resting and breeding sites along its length. Evidence from surveys and sightings suggest the tidal reach is being increasingly used by otters, and so the whole site is recorded as meeting favourable conservation status for the species.

5.10.7. Afon Gwy/River Wye SAC

The Wye probably holds the densest and most well-established otter population in Wales, representative of otters occurring in lowland freshwater habitats in the borders of Wales. The river has bank-side vegetation cover, abundant food supply, clean water and undisturbed areas of dense scrub suitable for breeding, making it particularly favourable as otter habitat. The population remained during the lowest point of the UK decline, confirming that the site is particularly favourable for this species and that the population is likely to be highly stable.

5.10.8. Afon Wysg/River Usk SAC

The River Usk is an important site for otters in Wales. They are reported to be using most parts of the main river from Newport upstream, and in recent years signs of otters have increased. Since 2000 there has been an expansion upstream on several tributaries, including the Honddu, Senni and Crai. The upper-mid Usk may have acted as a 'refuge' during the decline of the 1950s, and subsequently acted as a 'source' population for recolonisation of south-east Wales, especially neighbouring urban catchments of Ebbw, Llwyd, Rhymney and Taff.

5.10.9. Afon Twyi/River Tywi SAC

The Afon Tywi is one of the best rivers in Wales for otters, with abundant riverbank cover, good water quality and an ample supply of food. There are

abundant signs of otters and they are regularly seen on the river. There are many suitable breeding sites on the main river, and females with cubs have been seen. The river is recorded as being in favourable conservation status for otters.

5.10.10. Caerfyrddin ac Aberoedd/ Carmarthen Bay and Estuaries SAC

Carmarthen Bay and Estuaries on the south coast of Wales includes the sandbank of Helwick Bank, a linear shallow subtidal sandbank that is unusual in being highly exposed to wave and tidal action. The SAC provides an example of a large estuarine site on the south coast of Wales, encompassing the estuaries of the Rivers Loughor, Tâf and Tywi (coastal plain estuaries) and the Gwendraeth (a bar-built estuary). These four estuaries form a single functional unit around the Burry Inlet. Otters are present as a qualifying feature, but not a primary reason for site selection. The SAC provides otters with excellent foraging and a wide variety of marine prey. Females with cubs have been observed in many places around the coast, suggesting regular breeding within the SAC.

5.10.11. Afonydd Cleddau/Cleddau Rivers SAC

The Eastern and Western Cleddau Rivers flow through a largely lowland landscape, eventually joining and flowing into Milford Haven, which is part of the Pembrokeshire Marine cSAC. These slow-flowing rivers have a diversity of bank-side habitats, and good water quality ensures good stocks of otter prey species. The otter population on these rivers has shown excellent signs of recovery during the last 10–20 years, and is now thought to be favourable condition for the species.

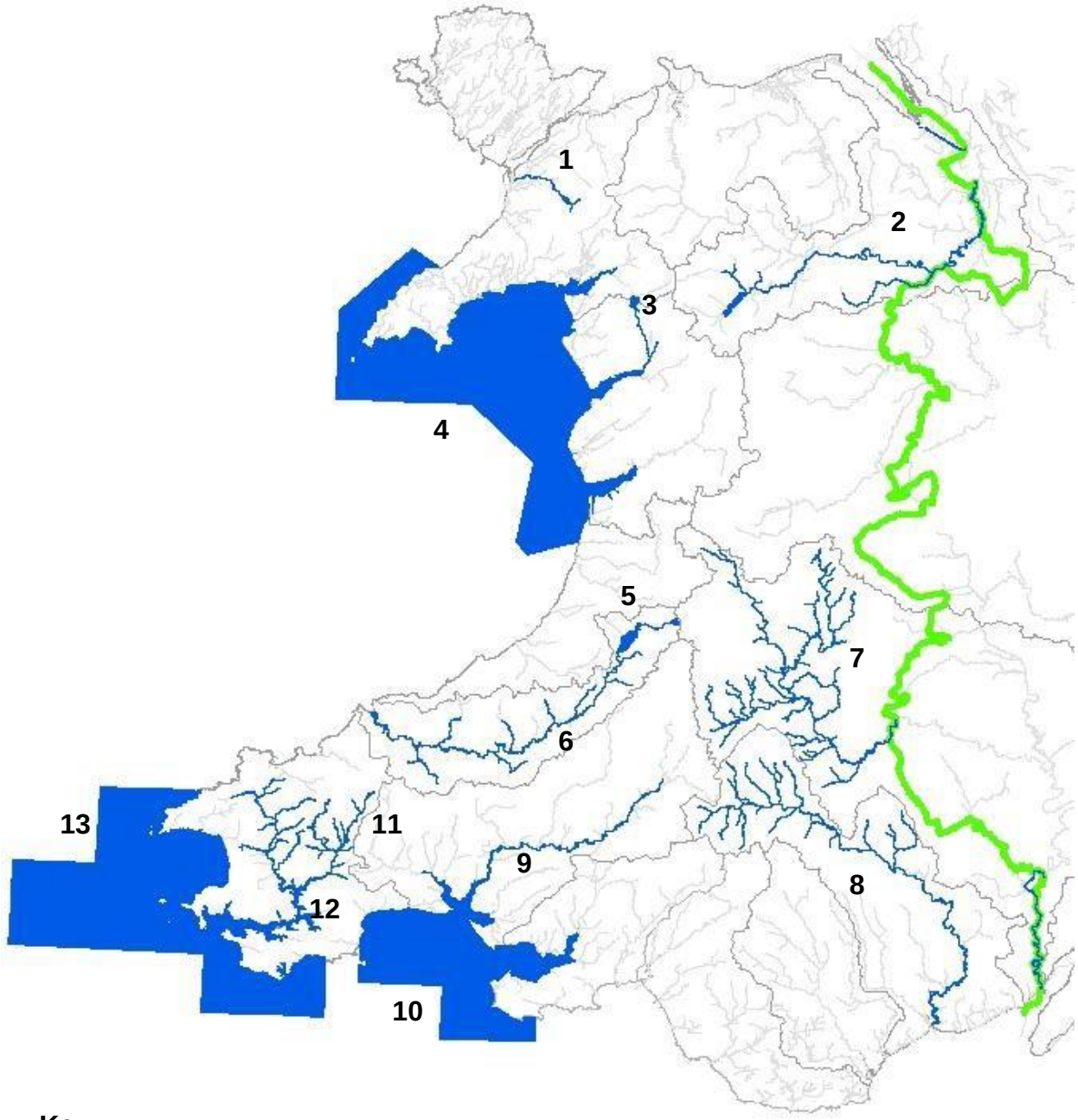
5.10.12. Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton/ Pembrokeshire Bat Sites and Bosherston Lakes SAC

Bosherston Lakes are an outstanding shallow marl lake system created at intervals in the late 18th and mid 19th centuries by damming a limestone river valley. They are fed in part by a series of calcium-rich springs and are isolated from the sea by a small sand dune ridge. This site in south west Wales also supports approximately 9.5% of the UK greater horseshoe bat *Rhinolophus ferrumequinum* population. Otters are a secondary feature of interest and are known to breed around the Bosherton lake, allowing many visitors close encounters. This regular breeding gives the species favourable conservation status at the site.

5.10.13. Sir Benfro Forol/ Pembrokeshire Marine SAC

Pembrokeshire Marine SAC in south west Wales includes the Daugleddau estuary, one of the best examples of a ria estuary in the UK. The site also includes examples of offshore reefs and large shallow inlets and bays as primary habitats. Like the other marine SACs, otters are present as a qualifying feature, but not a primary reason for site selection. The SAC provides otters with excellent foraging and a wide variety of marine prey. However breeding sites have so far been difficult to identify.

Map 24: **Special Areas of Conservation for Otters**



Key:

1. Afon Gwyrai a Llyn Cwellyn
2. Afon Dyfrdwy a Llyn Tegid
3. Afon Eden – Cors Goch Trawsfynydd
4. Pen Llyn a'r Sarnau
5. Cors Caron
6. Afon Teifi
7. Afon Gwy
8. Afon Wysg
9. Afon Twyi
10. Bae Caerfyrddin ac Aberoedd
11. Afonydd Cleddau
12. Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton
13. Sir Benfro Forol

6.1 Conclusions

The fifth otter survey of Wales was carried out via a series of survey weekends and catchment targeted survey days. This method had been tried and tested by the Snowdonia Mammal Group/Dwyryd Otter Partnership (Hall 2002, Hall & Williamson 2003, Strachan et al 2006, Williamson et al 2007), where experienced volunteers provided training for any inexperienced volunteers by double manning at survey sites during the survey days. Expert volunteer assistance had also been used for some catchments, namely the Ely, Loughor, Tywi and Ystwyth. All travel expenses incurred by volunteers was met for each survey catchment. For survey weekends cost of venue hire and B&B accommodation were also met. This way the total costs of the whole programme of work had been pared down to a minimum without reducing the total number of the survey sites to achieve full coverage. The total cost for the survey (£20,000) was calculated to be a third or less of the costs that would have been incurred had the survey been contracted out to professional ecological consultants.

The Otter Survey of Wales 2009-10 has confirmed that the otter has continued to increase its population and range throughout the area. It can now be considered as at or approaching carrying capacity on some river systems such as the Loughor, Cleddau, Teifi and Wye. This species even occupies highly disturbed waterways where it seems unaffected by human activity. Elsewhere it has consolidated its range and shown spread over the various catchments, with impressive gains recorded in Mid Glamorgan and on the island of Anglesey.
This apparent recovery has been in response to three main factors:

- A ban on the pesticides that were implicated in the decline and extinction of otters from many parts of England and Wales in the 1960s and early 1970s.
- Legal protection for the otter since 1978.
- The significant improvement in water quality in Welsh rivers since the 1970s.

This recovery has been the result of natural expansion from remnant populations, without the need for reintroduction, as elsewhere in the UK. The prospects for full recovery across Wales are very probable within the next decade. This represents a major success story for pollution control, as well as investment by the water industry and efforts by landowners and river managers to improve river and riparian habitat. Tracking the otter's recovery has demonstrated the benefits of long-term monitoring, and the use of this iconic species to raise awareness of pollution problems and the benefits of action to improve the environment.

Water quality improvement and improved fish stocks are thought to have assisted the otter's continued recovery, although there are still concerns about point source pollution, diffuse pollution and acidification issues within some watercourses. Migratory fish make up an important component of available fish in Welsh rivers, and salmon in particular are important to the

Welsh economy. There is some commercial exploitation of freshwater and migratory fish in Welsh rivers and coastal waters. Today, around 500 salmon are taken by commercial fixed engine and net fisheries in coastal and estuarine waters, although this is a shadow of the former industry that annually took over 5000 adult fish in the early 1990s (Anon 2012). Salmon and sea trout taken by rod and line however represent a valuable resource for Wales. Today some 5000 salmon may be rod caught each year with over half that number released back to the rivers following capture. The value of angling to the Welsh economy has been recently estimated at more than £150 million per annum (Mawle & Peirson 2009). The various Welsh Rivers Trusts recognise the importance of improving river habitat for adult fish, their spawning sites and fry, par and smoults. Much effort has been directed at getting riverbanks fenced as protection from livestock trampling and soil erosion. Riverbank trees are also being planted as a future measure to "keep rivers cool" due to expected climate change and air temperature rise. Salmonids are thought to be particularly sensitive to any rise in water temperature that may inhibit spawning and cause stress in both adult and juvenile fish. The upper river Wye is a focus of some of this work.

The Eel (England and Wales) Regulations came into force in 2010 and secured action on three fronts:

- Controls to ensure elver catches are recorded and can be traced;
- A requirement to ensure the phased installation of passes at obstructions and screens at abstraction and discharge points that impact on the migration of eels;
- A restriction on the fishing season for eel net and trap fisheries for 2010 as follows:
  - An elver fishing season from 15 February to 25 May.
  - A fishing season for yellow and silver eel from 1 April to 30 September.

There are currently around 50 eel and elver fishermen across Wales. Because of concerns about stocks, and the fact that eels grow slowly and are easily over-exploited, eel fishing has been restricted to those who were existing fishermen and have held a licence/authorisation since 2008.
The decline of eels within the Welsh network of watercourses may have a knock-on influence on otters, as they are an important component of the their diet throughout the year (Watt 1995, Strachan *et al* 2006).

Road traffic accidents remain a substantial cause of non-natural otter mortality. However, there is a growing trend to incorporate suitable mitigation measures for otters in any new road schemes and where accident black spots occur. The Roads and Otters Steering Group in Wales has been instrumental in collating information and recommending best practice to reduce future risk for otters.
Accidental drowning in lobster creels or crab pots around coastal inshore waters is another concern, but the scale of the problem and subsequent effect on otter populations has not yet been fully quantified. Guidance on the careful placing of crustacean traps away from shallow inshore waters could alleviate the problem. New designs of creel with otter excluders may also be available in future years.
All of the Special Areas of Conservation where otters are listed as part of the

qualifying interest were confirmed to support the species, and are now assessed to be in favourable condition with regard to the species, especially within the Marine SACs that have all shown evidence that breeding animals are present.

7.0 Recommendations

7.1 Future surveys

The present survey has highlighted the continued recovery of the otter in Wales which is now considered to be widespread and abundant.
Otters in Wales now appear to be reaching saturation levels with future occupancy at the National Otter Survey sites likely to exceed 95 percent. Is it prudent to continue to monitor otter distribution and status across Wales and to assess any potential future threats across the species' range?
It is recommended that future surveys should prioritise surveillance and monitoring of otters to inform the Site Condition Monitoring of Special Areas of Conservation (Natura 2000 sites) where the otter is a primary or secondary feature of interest. In Wales, six SACs have the otter as a primary feature with a further seven where the otter is a secondary feature.

SAC condition monitoring requires an assessment of the favourable conservation status of the otter within each site, but this also needs to be put into context of how the species is faring in the wider landscape. Future otter surveys should attempt to provide that bigger picture at the same time as informing SAC site condition. A survey that revisits all or part of the national survey compliment is therefore recommended, coinciding with the SAC survey cycle.

- Survey of the subset of National Survey sites that comprise each of the SACs where the otter is a feature of interest every 6 years. This to inform the site condition monitoring cycle of Natura 2000 sites with special assessment to determine key breeding sites (Liles 2003).

- Full survey of all previously documented sites within each of the 10km squares that comprise the National Survey every 12 years

- Extension of the National Survey to cover coastal Wales outside of those coastal SACs where the otter is a feature of interest.

- Use of DNA extraction from collected spraints for genotyping analytical techniques, to better inform estimates of otter population in Wales

7.2 Site protection

In terms of conservation of otters in Wales and elsewhere, the identification and protection of breeding sites should be regarded as a priority.
This would also ensure that breeding sites for otters are available within the boundaries of the various SACs/SSSIs where the species is listed as a feature of interest.

- 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. This can be achieved through implementation of the Water Framework Directive.
- Facilitate range expansion across priority habitats within WFD catchments, Living Landscapes and Futurescapes initiatives

7.3 Species Protection

The following are recommended to ensure adequate species protection in Wales

- 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 for effective mitigation measures.
- Other anthropogenic mortality factors should also be documented and assessed where concern has been raised, such as the accidental drowning of otters in lobster or crab pots, fish nets or eel fyke-nets.

7.4 Conservation advice

Where appropriate, information on otters should be disseminated to ensure the species achieves favourable conservation status.

- Ensure that the advice given via Glastir officers and other farm advisers, for the general improvement in riparian and wetland management, includes measures for 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.

7.5 Evidence gaps and research

The Wales Biodiversity Partnership recently assessed what evidence gaps there were among the priority BAP species. For the otter the following were identified.

- Support the work being undertaken at Welsh universities on the genetic analysis of otter spraints, to better inform the population estimates within catchments and across Wales. Support and encourage the development of methods for assessing otter abundance, including work on social structure and behaviour.

- Support the work being undertaken at Welsh universities on the analysis of otter spraints, to ascertain the seasonality of prey and its linkage to prey biomass.

- Maintain an otter health surveillance system through a programme of post-mortem work. Increase screening to include an assessment of emerging eco-toxicological chemicals and diseases.

Otter resting among sea weed at Llyn bach, Porthmadog (Photo: R.Strachan)

8.0 Acknowledgements

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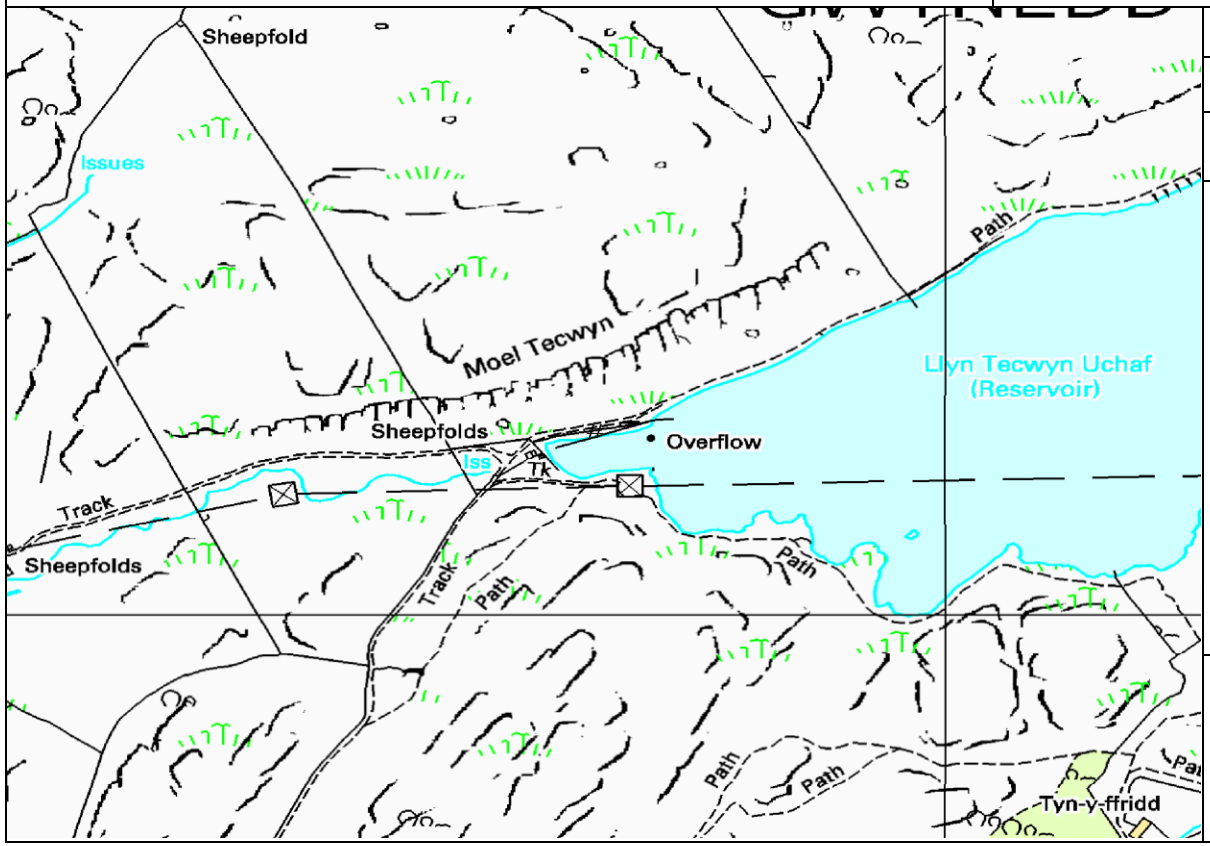
10.0 Appendix Standard survey form

Site no **G80**	Site name **Llyn Tecwyn Uchaf**	Grid reference start **SH 637 382**
Recorder	County **Gwynedd**	Date of visit



Distance surveyed (and details)
Otter signs seen
Grid reference otter signs
Description of spraint sites and comments (anything effecting survey)
Other species of note
Mink signs: Absent Present