



### **Catchment**

The Dwyfor catchment is divided into two main rivers, the Afon Dwyfawr and the Afon Dwyfach. The Dwyfawr subcatchment is mountainous. It rises in Cwm Pennant and has one main tributary, the Afon Cwm Ystradllyn (also known as the Afon Henwy). The Cwm Pennant streams in the upper reaches of the Dwyfawr are acidic. They drain unafforested mountains of base-poor Ordovician rocks overlain by acidic, often waterlogged soils with low buffering capacity. The Afon Dwyfach has a moorland catchment and is less acidic.

Naturally elevated levels of zinc are characteristic in the catchment. This is evidenced by the presence of disused zinc mines dotted throughout the area. Disused copper mines and slate quarries are also found. Current industries in the catchment include a sand and gravel quarry and a cement works.

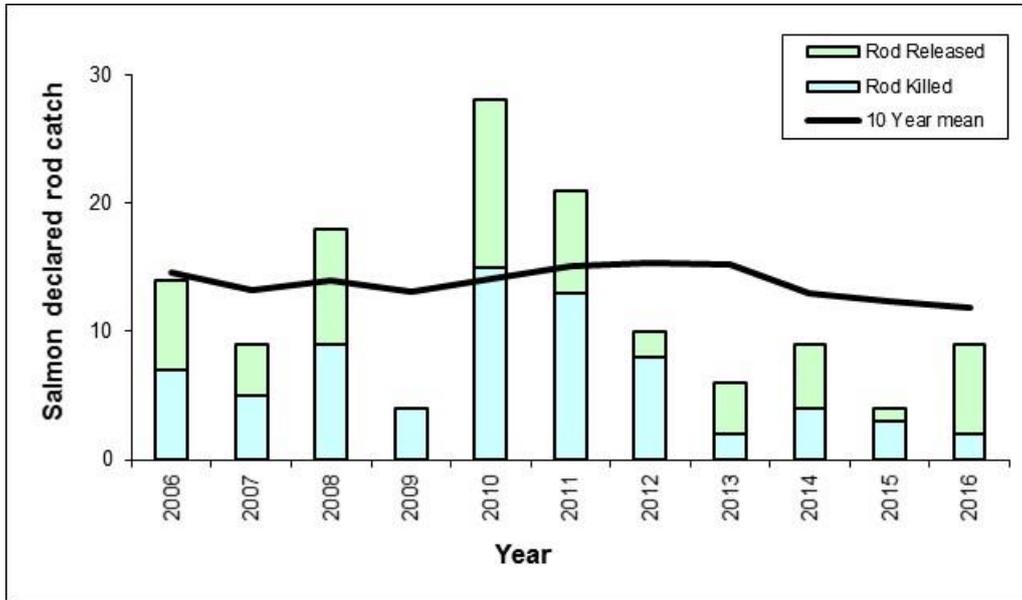
There is a major water abstraction scheme in the catchment, involving Llyn Ystradllyn and the Afon Dwyfawr, known as the Garndolbenmaen scheme. Under this scheme Welsh Water/D\_r Cymru are licenced to abstract a combined total of 5 million m<sup>3</sup> of water per calendar year from Llyn Cwmystradllyn and the Afon Dwyfawr at Dolbenmaen. Welsh Water/D\_r Cymru are required to maintain a uniform continuous compensation water discharge of 3010 m<sup>3</sup> per day for the general benefit of riparian river interests. Freshet releases must be made for fisheries management and angling purposes.

A high proportion of the Dwyfor catchment is available for spawning. However impassable waterfalls in the upper reaches of some of the tributaries of the Dwyfawr restrict salmonid access.

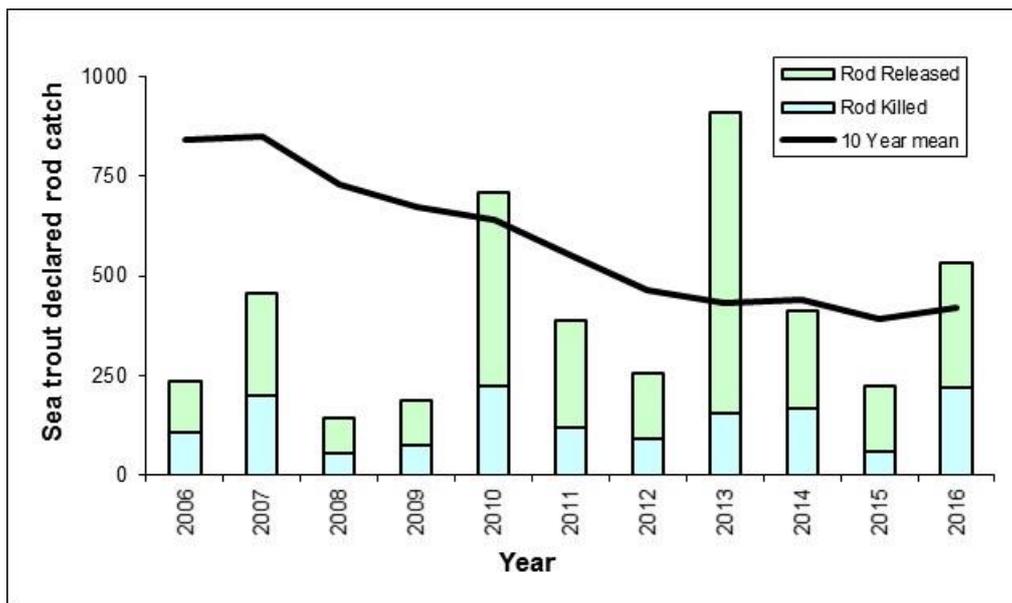
### Rod catches

The following graphs show the total declared rod catches of salmon and sea trout on the Dwyfor.

**Salmon rod catch** – has remained poor. The release rate in 2016 was 78%, which is much better than last year and needs to be maintained to conserve stocks. The North Wales average is 62%.



**Sea trout rod catch** –rod catch in 2016 was good compared to the last ten years. However, the release rate was a disappointing 58%, and much lower compared to last year. The North Wales average is 79%.

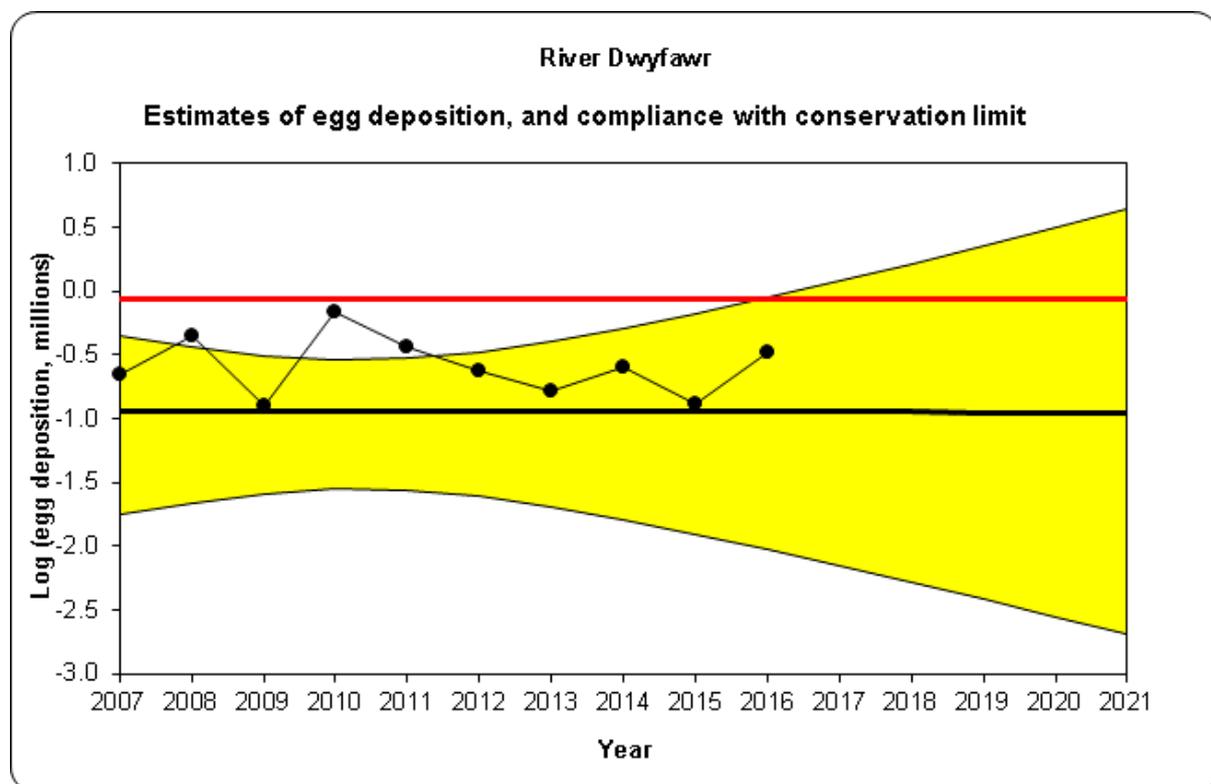


## Stock status

### Conservation of Salmon

Salmon stock status is assessed using 'Conservation Limits' which provide an objective reference point against which to assess the status of salmon stocks in individual rivers.

This is calculated by applying assumed angling exploitation rates to catch data to derive run estimates; adopting standard sex ratios and weight-fecundity relationships to generate egg deposition figures. The numbers of salmon a river can produce (and consequently the catches that the stocks support) are a function of the quality and quantity of accessible spawning and rearing area. Therefore, in general, big rivers have larger catches and have correspondingly bigger total spawning requirements than small rivers. Thus, for any given rivers there should be an optimum level of stock which the conservation limit seeks to protect. The conservation limit represents the number of eggs that must be deposited each year within a given catchment in order to conserve salmon stocks in the future.



Are enough salmon eggs being deposited to conserve salmon stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy salmon stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent 10-year series of egg deposition estimates (2007-2016).

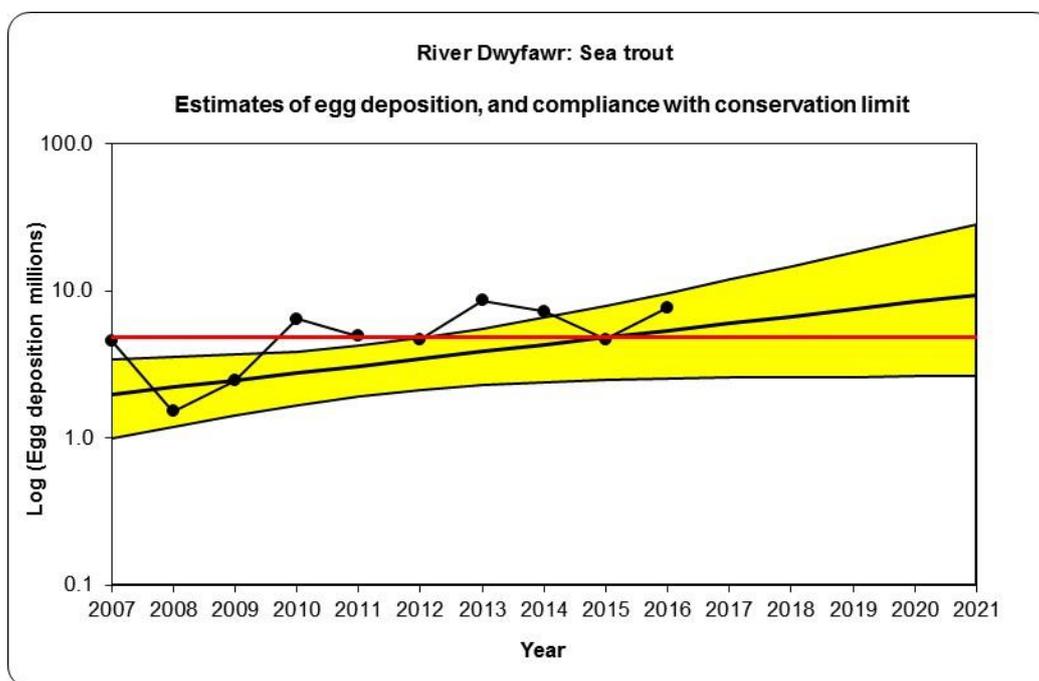
- Current number of eggs being deposited puts stocks **probably at risk**
- In 5 years' time the predicted status of salmon stocks will be **probably at risk**
- Based on current data, and the projection of the graph, the stocks of salmon on the Dwyfor will continue to **decline (uncertain)**

## Conservation of Sea Trout

In contrast to salmon, no established methods of setting Conservation Limits or similar have been available for sea trout. In the absence of such analysis, NRW and the Environment Agency have, for several years, routinely applied a fishery based assessment to the principal sea trout rivers. This method – used previously in this report - utilises time-series' of angling catch per unit effort (CPUE) data ('catch per day') to examine sea trout performance on a river-by-river basis.

Recently an alternative stock-based assessment method has been developed by NRW and is applied here. This utilises angling catch data to derive run and egg deposition estimates for sea trout in much the same way that similar data sets are used in Conservation Limit compliance procedures for salmon assessment.

Further details on this method are given in the recent Technical Case supporting net and rod fishery byelaw proposals on all rivers in Wales and the cross-border rivers Wye and Dee (see: <http://naturalresourceswales.gov.uk/media/682258/technical-case-structure-final.pdf>)



Are enough sea trout eggs being deposited to conserve salmon stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy sea trout stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent 10-year series of egg deposition estimates (2007-2016).

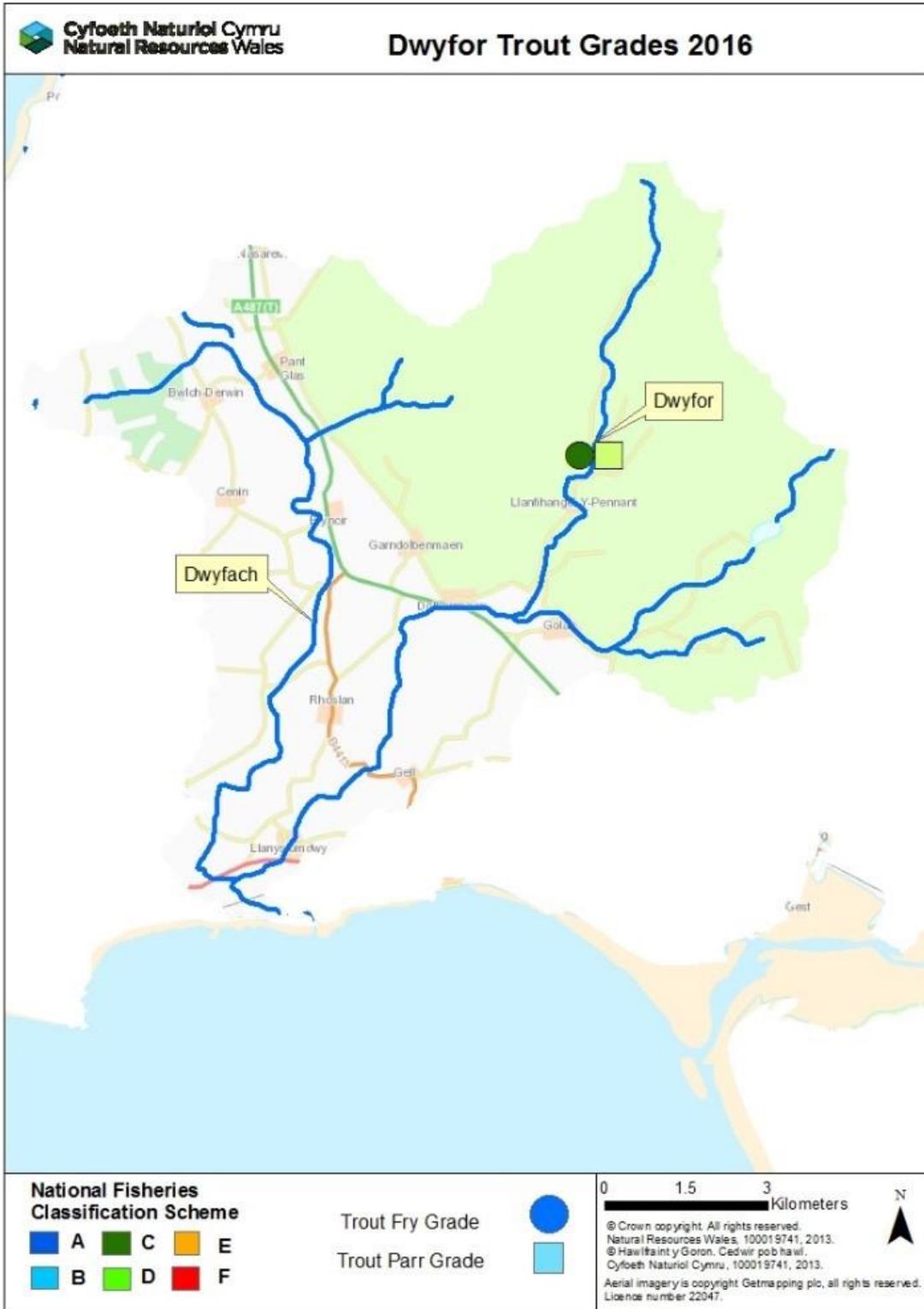
- Current number of eggs being deposited puts stocks **probably not at risk**
- In 5 years' time the predicted status of salmon stocks will be **probably not at risk**
- Based on current data, and the projection of the graph, sea trout stocks will continue to **improve (uncertain)** on the Dwyfor

## Juvenile Monitoring

The following map shows the results of the 2015 juvenile salmonid population surveys. They display the National Fish Classification (NFC) grades which have been developed to evaluate and compare the results of fish population surveys in a consistent manner. The NFC ranks survey data by comparing fish abundance at the survey sites with sites nationally where juvenile salmonids are present. Sites are classified into categories A to F, depending on densities of juvenile salmonids at the site. The following table shows the values and classification of NFC.

GRADE	Description	Interpretation
<b>A</b>	Excellent	In the top 20% for a fishery of this type
<b>B</b>	Good	In the top 40% for a fishery of this type
<b>C</b>	Fair	In the middle 20% for a fishery of this type
<b>D</b>	Fair	In the bottom 40% for a fishery of this type
<b>E</b>	Poor	In the bottom 20% for a fishery of this type
<b>F</b>	Fishless	No fish of this type present

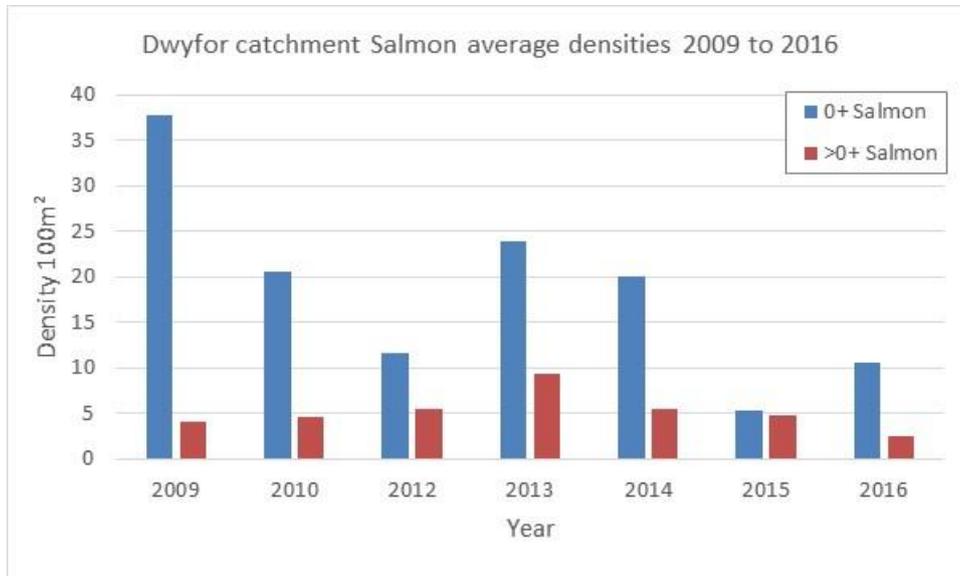




### Juvenile Trend Analysis

Statistical analysis of the juvenile monitoring programme is currently being reviewed. The graphs below are catchment averages for salmon and trout from 2009 to 2016.

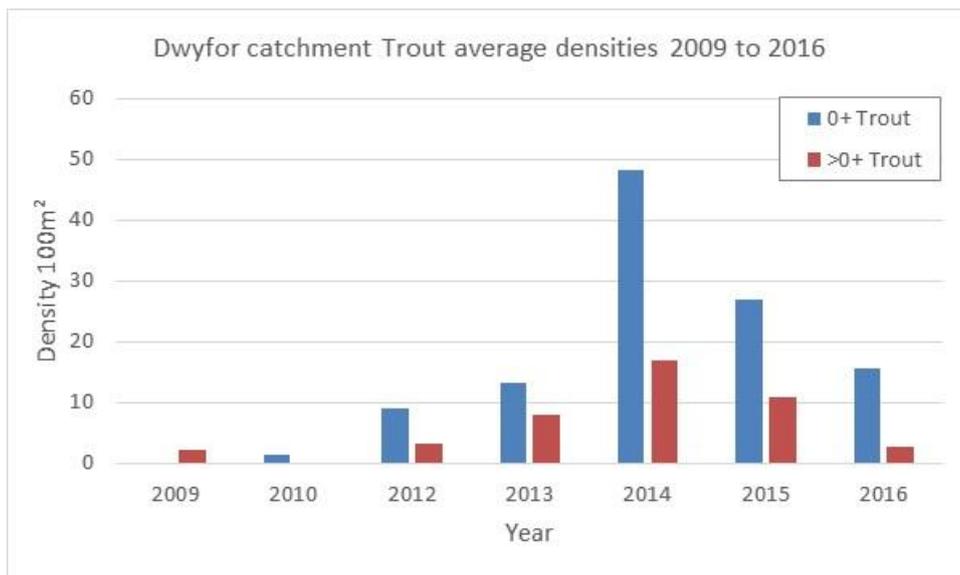
#### Salmon



Salmon fry and parr densities have declined since we began monitoring the site on the Dwyfor. This follows the general trend of the salmon rod catch which has declined since 2010.

Juvenile salmon densities across Wales in 2016 have been poor, with some catchments showing significant absences of salmon fry. Though declining spawning stock will have lowered recruitment, it was felt that the extremely high flows and unseasonably warm temperatures throughout Nov/Dec/Jan will have adversely affected spawning.

#### Trout



Brown trout fry and parr densities on the Dwyfor catchment link directly to the rod catch. The improved trout fry numbers in 2014 link directly to the good sea trout run in 2013. The decline

in trout fry and parr is mirrored by declining rod catch in 2014/15. We would expect trout fry numbers to improve in 2017 due to the rod catch improvement in 2016.

## Dwyfor catchment summary

### Fisheries Action – Dwyfor

Site	Action	Benefits	Lead	Partner(s)	Timescales for delivery
Dwyfor	<b>Habitat improvements:</b> We will investigate where there is opportunity to improve habitat for fish through improving access over barriers, restoration of riparian and instream habitat, including control of invasive species.	More natural river system, reduced siltation, increased flow diversity, improved spawning gravels and juvenile habitat. Improved fish numbers.	NRW		Ongoing
	<b>Water Framework Directive:</b> We will continue work to ensure no deterioration, monitor the status of the environment and investigate causes of failures. Together with our partners we will look to put in place measures that protect and improve the status of the water environment.	<ul style="list-style-type: none"> <li>• Waterbodies protected and improved</li> <li>• WFD waterbodies achieving Good Status/Potential</li> </ul>	NRW	NRW Wildlife Trusts Local Authorities Landowners DCWW	Ongoing
	<b>Enforcement:</b> Action to reduce illegal activity on information provided and investigations	Reduced illegal activity, more fish remain in the system.	NRW	Stakeholders North Wales Police	Ongoing

#### Abbreviations

NRW – Natural Resources Wales

DCWW – Dwr Cymru Welsh Water