

River Dee regulation,  
unnatural flows and their  
impact on the wildlife of  
the Dee and Llyn Tegid  
Special Area of  
Conservation



THE  
WELSH DEE TRUST

October 2022

# Foreword

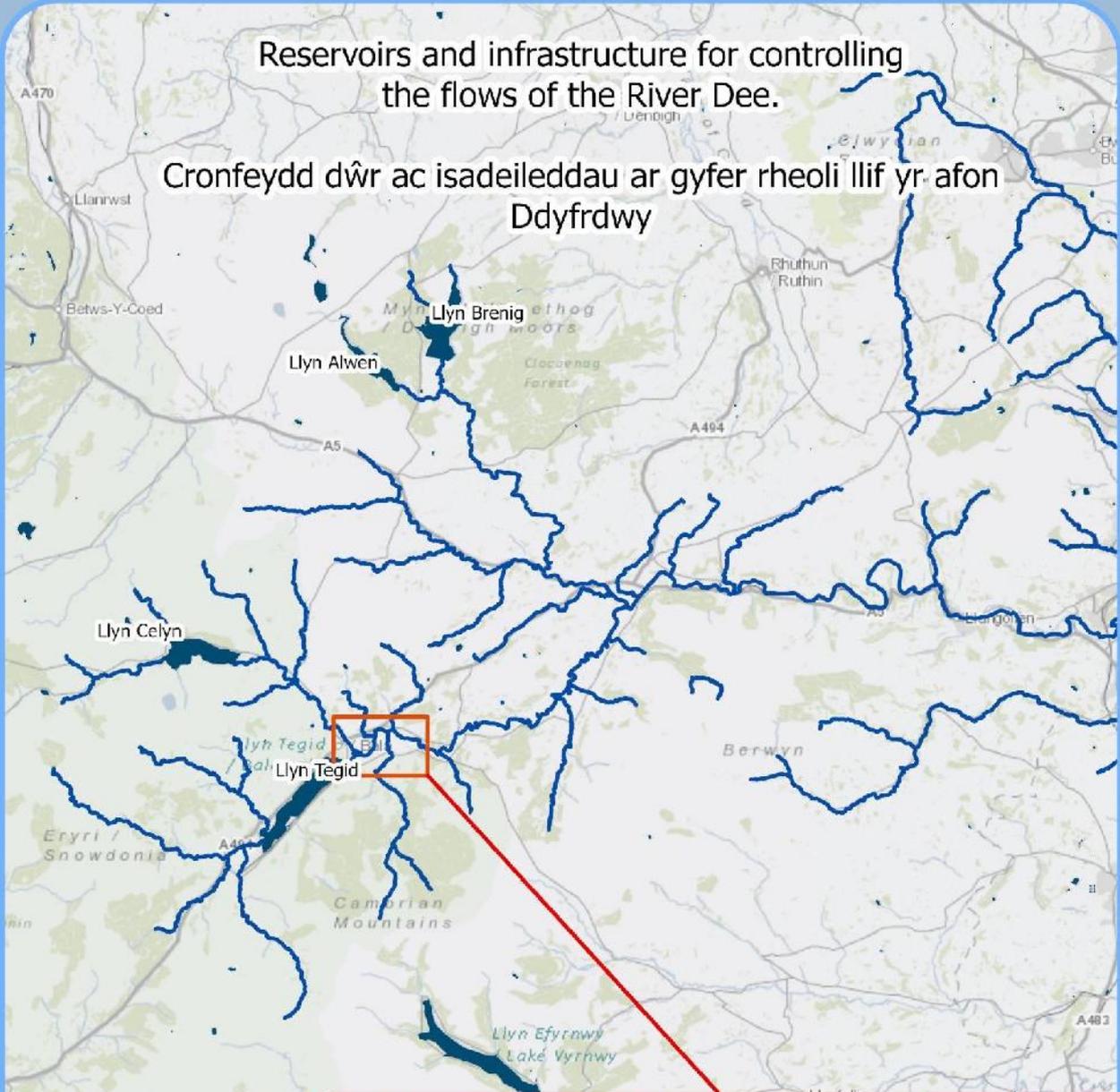
From Llyn Tegid to the Cheshire Plain, the River Dee is varied, beautiful and loved by its local communities. It is full of wildlife, including many endangered species, and provides an important recreational fishery for both local and visiting anglers. It is right then that the river is a Special Area of Conservation (SAC), the highest level of environmental protection available in the UK.

However, the River Dee also has a large demand put on it by society. The Dee provides clean drinking water to two million households via abstractions downstream of Llangollen. To ensure there is enough water to meet this demand the river levels of the Dee are some of the most managed in all Europe. A minimum river level is maintained to allow abstraction while also providing a guaranteed flow at Chester weir. This means the amount of water released from the Dee's three reservoirs and Llyn Tegid is constantly manipulated. This is leading to unnatural flow patterns in the rivers Dee and Tryweryn. Natural Resources Wales (NRW) manage the releases to guidelines set by the 'Dee Consultative Committee' comprising NRW, United Utilities, Dwr Cymru, Hafren Dyfrdwy and Canal & River Trust.

Our concern at Welsh Dee Trust is that wildlife and fisheries are damaged by the current flow patterns and the infrastructure required. When species of the SAC are classed in an 'unfavourable' condition, and the Salmon and Sea Trout fishery declared as 'probably at risk' action needs to be taken to reduce this damage.

Reservoirs and infrastructure for controlling the flows of the River Dee.

Cronfeydd dŵr ac isadeileddau ar gyfer rheoli llif yr afon Ddyfrdwy



# Introduction

The river flows of the Dee are some of the most regulated and augmented within Europe. The demands of providing enough drinking water, recreation opportunities and reducing the risk of downstream flooding create the need for constant regulation. The River Dee is also a Special Area of Conservation (SAC), home to many vulnerable, endangered and critically endangered species as well as being an important recreational fishery. Welsh Dee Trust has identified three key problems where river regulation is impacting the river. These are:

- 1 Reduction of spates within the main body of the Dee (spate clipping)
- 2 Large unnatural fluctuating flows within the river Tryweryn
- 3 Challenges with fish migration around Bala sluices

In this report, we make 9 recommendations which we feel will reduce the impact of the regulation scheme.

## Dee Consultative Committee

Natural Resources Wales (NRW) manage the flows of the Dee using the 'Dee General Directions' and the 'Drought General Directions'. The directions are subject to approval by the Dee Consultative Committee. This comprises NRW, Environment Agency, Hafren Dyfrdwy/Severn Trent Water, United Utilities, Dwr Cymru and Canal & River Trust. During normal operations, the target is to allow 4.2 m<sup>3</sup>/sec to flow over Chester weir while providing enough water for abstraction and recreation. A special release allocation can also provide additional releases to benefit fisheries, water quality or maintain flows during droughts.

**Recommendation 1: Publish regular information on current reservoir levels and release plans.**

Alongside benefitting river recreation users, this will increase transparency and knowledge for individuals and organisations.

# Problem 1: Spate clipping

A spate is the naturally occurring high water from snowmelt or rainfall, usually rising to a peak within 24 hours then declining over several days. Most of these spates remain within the riverbanks and do not cause flooding. These spates are vital for creating a variety of habitats within the River Dee and the completion of lifecycles of many species (Milner, Solomon & Smith 2012; Petts 1980; Solomon 1978). In particular, the size, timings and speed of increase all have a vital impact on when and how Atlantic Salmon *Salmo salar* migrate both up and downstream (Thorstad, Økland, Aarestrup & Heggberget 2007).

Welsh Dee Trust has studied the hydrographs for the River Dee and are concerned that spate clipping is taking place several times a year. Spate clipping is when the size, duration, or speed at which the spate rises is reduced. This occurs when the rainfall is held back within one of the reservoirs or Llyn Tegid, thereby greatly slowing the initial spate rise (important for triggering migration) and the subsequent sustained higher flows which facilitate continuing migration and fish passage of the weirs at Manley Hall, Erbistock and Chester.

Welsh Dee Trust believe additional release should put in place to:

- Ensure most spates, including small ones, are allowed to exist in a close to natural form (particularly from April to October);
- Increase the speed at which spates rise to better follow what would happen in a natural system.

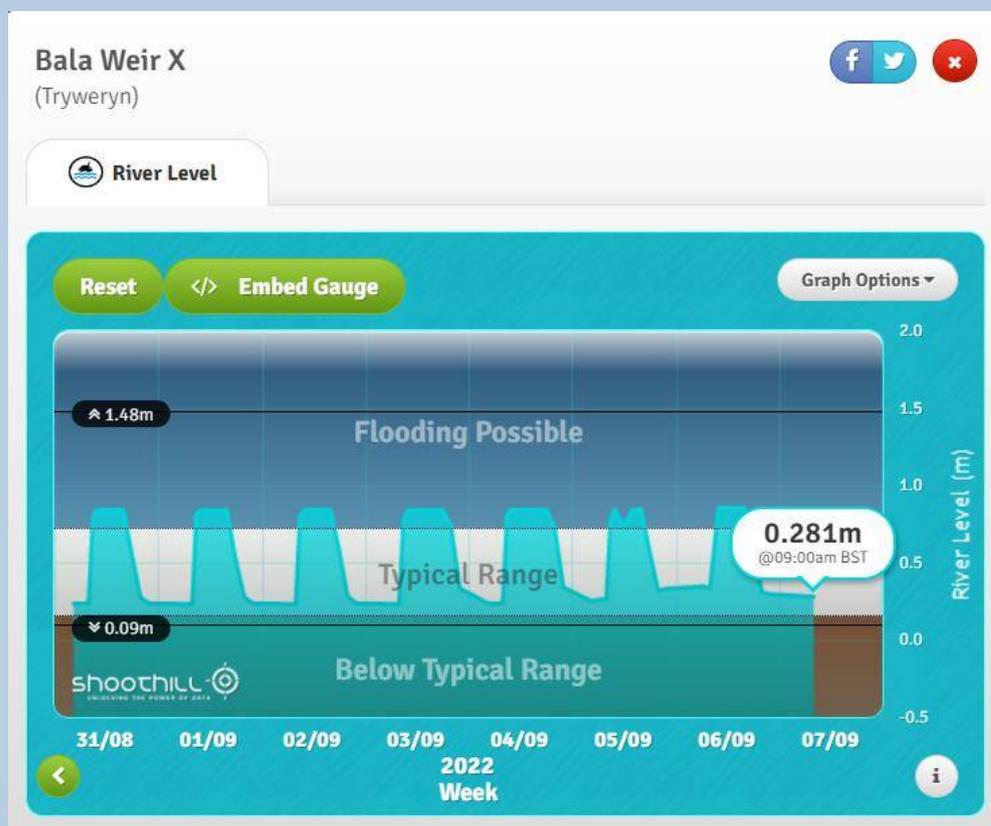
**Recommendation 2:** Release additional water after rainfall from Llyn Tegid and Celyn reservoir to naturalise spates.

**Recommendation 3:** Continue regulation release during naturally occurring spates to prevent the spate increase from being offset by reduced regulation release.

# Problem 2: Large, unnatural flow fluctuations in the River Tryweryn

The level of the River Tryweryn is controlled by flows from Llyn Celyn. These releases from the reservoir fluctuate massively within the day. This creates a highly unnatural environment within the river. In some cases, 9 m<sup>3</sup>/sec of water can be released during the day, before reverting to around 1 m<sup>3</sup>/sec during the evening. In winter, release must be maintained over 24 hour periods for fisheries purposes; this is not the case during the summer.

When more water is released from Llyn Celyn than Bala sluices, a flow reversal is created where water travels upstream into Llyn Tegid.



At Welsh Dee Trust we are concerned these high fluctuations will be negatively impacting the wildlife of the Tryweryn. Our recommendations would help to identify and reduce these impacts.

Recommendation 4: Investigate, identify, and take steps to reduce environmental impacts from large fluctuations in releases.

Recommendation 5: Ensure releases from Llyn Celyn match releases from Bala sluices, eliminating reverse flows into Llyn Tegid, especially during the smolt migration period (March – May).

# Problem 3: Fish migration through Bala sluices

Bala sluices, like many other man-made structures in rivers, pose a significant barrier to both upstream and downstream migration of fish (Davies et al. 2021; Marschall et al. 2011; Thorstad et al. 2007). Delayed migration can increase predation (particularly on migrating Salmon smolts) (Havn et al. 2020). Even when fish successfully pass a barrier, they are likely to have been delayed, thereby reducing spawning success (Garcia De Leaniz 2008; Havn et al. 2020). In particular cases, the design of the barrier can also cause damage and increased mortality to fish as they move through it (Renardy et al. 2021). NRW are currently undertaking salmon smolt tracking to better understand movement through Llyn Tegid and the Dee. Welsh Dee Trust would like to see these studies continued and expanded to other migratory species; we also feel there are actions which can be taken immediately to make improvements.

**Recommendation 6:** Continue studies to identify the preferred gate configuration for downstream smolt migration and prioritise this configuration during the smolt migration period.

**Recommendation 7:** Take measures to improve natural habitat cover for fish in the areas around the sluices to reduce predation levels.

**Recommendation 8:** Remove Weir X to improve fish migration.

**Recommendation 9:** Make changes to Weir Y and Bala gauging weir to reduce impact on fish migration.

## Conclusion

Currently features of the Llyn Tegid and River Dee SAC are failing to achieve 'favourable' condition (Countryside Council for Wales 2008). At Welsh Dee Trust we have concern that the man-made flow regime of the Dee is causing harm to the wildlife of the river including rare and protected species. This report sets out nine recommendations that we believe will reduce this impact. We appreciate that some of these recommendations will be challenging or possibly even impossible to implement, but we hope that we can continue work to make improvements for the wildlife of the Dee.

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